THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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ELECTRICAL PROGRESS IN SHANGHAI.

VERY encouraging reports have reached us regarding the rapid rate at which electrical advance is taking place in Shanghai. The municipal electricity supply department is giving a very strong lead, and, with the display of spirited enterprise in the provision of facilities, there is a growing disposition on the part of the public to avail themselves of electrical supply for lighting, heating and power purposes.

The new Riverside power station is now nearing completion, and in about three weeks' time it will start running. This station is designed to accommodate a plant of 14,000 KW. capacity, and the first instalment, which was put in last year, amounts to 4,000 KW. Already the engineer has laid before his Council the necessity for putting in further extensions, and it has been decided to call for tenders in the course of a few months for two 5,000-KW. turbo-alternators and condensers, together with the necessary boiler plant.

It is interesting to learn that the Department is taking a very live interest in electric vehicles. Its present equipment consists of a fleet of five petrol motor-cars and a 2-ton motor-lorry, but owing to the enormous increase of business and the large area to be covered—10 miles from end to end—it is considered more efficient, in order that the staff may get about more rapidly, to increase the number of cars by four or five more, while there is also to be added a 5-ton motor-lorry, with a crane attached, for handling heavy goods. The prevailing conviction there seems to be that it is the business of an electricity undertaking to use "everything electrical" as much as possible, so it is more than likely that the new cars will be electric and that the replacement of the existing petrol cars with electric will follow. Certainly the latter should possess greater electrical advertising value than would petrol ones, and the adoption of electric cars by the public, as well as an extension of everyday electrical applications, should also ensue. It is not surprising that the remarkable development of the electric vehicle in the United States should have turned attention in that direction We have again and again had to deplore in these columns how backward we in this country are in this respect, though we admit that there are other causes responsible beside apathy. It is practically certain that if we are behindhand with the use of a class of requirement, we are in danger of being behindhand also in its manufacture, and somebody else may profit because he has advanced more progressively than we. We do well if we weigh up the electric vehicle question with this additional possibility in our minds.

In Shanghai, which is perfectly flat and has good roads, an effort to push the electric vehicle is thought certain to be followed by a great success, provided that the battery and electric equipment are looked after by competent people, and

we should say that the good example of the Electricity Department would count for much with the public. One result of so excellent a move would doubtless be that before long there would be several hundreds of electromobiles in Shanghai, all of which would naturally take their current for charging purposes from the municipal supply department, and, may be, they would be "after the pattern" of those used by that Department. Supply can be given to charge batteries for such a purpose at ·7d. per unit or even less, and as the price of petrol is going up all the time this should form an added electrical inducement. The number of the "Point Fives" in this country is, as our readers know, small at present, but it is not the fault of the municipal electrical engineer of Shanghai that he is not already among their number. As a matter of fact, the Electricity Committee has twice passed a suggestion emanating from him that a flat rate of 1·7 candareens per unit, which is equivalent to ½d., should be introduced for all energy used for heating and cooking. It was the Council that did not see its way to let Shanghai have the credit of adding to the membership of the enterprising Point Fives Club, for it was not prepared to confirm its Committee's recommendation at the first time of asking, while at the second it compromised by authorising a reduction to ·7d. Perhaps the club will recognise the qualifications of Mr. Aldridge, and duly fête him during his stay here in the coming summer.

It may be more or less of a revelation to our readers to learn what admirable advance is taking place in the adoption of electric radiators by Chinese consumers on the Shanghai circuits. During the past winter these westernised gentlemen have given us an illustration of what we may be able to do among others of their colour as we try to develop our radiator business in this Far-Eastern world. The total connections of heaters and cookers in Shanghai now aggregate over 500 KW.

But it is not only in lighting and heating that there is gratifying electrical enlightenment in this international municipal community. Our electrical firms who do not already know it, should take note that the cotton industry there is at the present moment booming. One small mill of 10,000 spindles has already been electrified, and there is in contemplation the electrification of an additional 30,000 spindles in the same mill. At another mill the electricity department has a contract for a supply of 500 KW., and at yet another for about 450 KW., both of which consumers will go on to the mains within a few months; while, still further, there is a 50,000-spindle new mill in prospect. Knowing what we do of events in the textile industry at home and in some other countries, we are justified in anticipating that the electrification of several of the older Shanghai mills, and the adoption of electricity by a new one, will ultimately result in bringing into line numerous other factories of the same class which have been running for a great number of years. While all this is most gratifying and encouraging from the purely electrical point of view, it has a distinctly unfortunate side, at the moment, from the purely *British* standpoint, for we gather that German firms, displaying that enterprise which we have so often felt it our duty to refer to in relation to their Chinese electrical business, are securing the bulk of this work. We have again and again discussed reasons for their successful competition with us in this market, and while it is not our present intention again to go over that ground in detail, we should be shirking our responsibility did we not mention it here, seeing that it is one of the great factors that must not be lost sight of in our rejoicing at the unhindered progress of electricity.

Observers who are well qualified by long experience and close association with the market and its conditions, have no difficulty in explaining our relative backwardness. They say now, as they have said in our pages on previous occasions, that our Continental friends succeed readily because they co-operate willingly with prospective customers. They get out special motors suitable for cotton spinning, such as those for variable speed on ring frames, and also small loom motors. These they put in experimentally free of cost, and the low rate charged by the electricity department assists them in their effort to secure a satisfied power-user. It will be to our enduring shame and regret if the great bulk of the Shanghai mill motor equipment work falls into the capacious lap of the Fatherland. But there it is. Such is feared to be a correct impression of the prospect. Our manufacturers cannot say that they do not know. What are they going to do to meet the situation? Can they—will they—do nothing? Obviously it is the work of the Electricity Committee to sell electricity, and to encourage anybody who will assist it to that end, and an international municipal council can hardly be expected to be swayed either by British or German influences where merit and enterprise (which cover, we suppose, both price and quality considerations) must be the deciding factors.

One—indeed *the*—outstanding feature of the position seems to be that upon which so much stress has been laid here—our need for organisation and combination. If our information be correct, and we believe that it is largely so, while most of the big English firms are represented in Shanghai and other cities by merchant houses—who, it is said, do very little for the people whom they represent—the large German manufacturers have their own representatives on the spot (sometimes Germans, sometimes Englishmen—as has happened in some of our Colonial markets) who are most highly trained engineers and men well qualified to discuss matters in technical and commercial detail, and are armed with that full measure of authority which enables them to settle matters direct without referring things home to the Fatherland.

In opposition to this trump card in competition, what do we produce?—English engineers who are so versatile that their duties embrace quoting for anything from a steel bridge to a power station, and who cannot therefore be expected to possess that detailed experience in all the branches of engineering in which they are called upon to do business. Consequently, instead of being able to enter into a contract right on the spot without waste of time, they have to refer the matter to—"the dear Homeland"! That there are difficulties in the position we fully recognise, difficulties that are not lessened by the fact that there are a number of conflicting interests and competitors, while with our Teutonic rivals the competition is practically limited to three or four big combinations. But to sit and sigh and let the work pass by is not generally like the British race. Let us, at least, continue to attend to this setting up of more suitable and efficient British representation abroad—especially in China—that so many authoritative voices have urged upon us in the last four or five years. A little has been done, but in the words of Cecil Rhodes, "So much remains to do!"

Advertising Electricity.

We report this week a paper on this subject, read before the I.E.E. by Mr. H. C. Palmer, in which a definite scheme of organised publicity is put forward, having for its aim the education of the public to a better appreciation of the advantages to be derived from the use of electricity for domestic purposes. This is a matter which has occupied a prominent position in the proceedings of the Institution during the past year or two, and which, as the outcome of the recent reforms, will doubtless command more and more attention

in the future. That there is an urgent need for action in this direction can hardly be questioned; that need has existed for some years, and has grown continuously more insistent. The aggressive and enterprising policy of our rivals, embodied in the British Commercial Gas Association, has greatly increased the urgency of the question, and has at the same time shown what can be done even in this country by organised and co-operative effort.

There is nothing new in the idea; as long ago as 1906 we published a series of articles by an expert, Mr. R. B. Matthews, with the express purpose of arousing our central-station managers to a due appreciation of the possibilities before them, and the best means of realising those possibilities. Other articles of a similar nature have appeared in our pages from time to time during the past decade, but the result has been far from satisfactory. We believe that this is not wholly the fault of the engineer-managers, many of whom are strongly in favour of an active policy of advertisement; the difficulty is due rather to the control of the great majority of our electricity supply undertakings by inexpert committees, often composed largely of small tradesmen and professional men who have no conception of the meaning of organised publicity, and whose hands are tied by the restrictions imposed by the Local Government Board's auditors. It must be said, however, that at the present stage of development of the business, which is gradually being evolved from the condition of an engineering problem to that of a commercial undertaking, the first element of the compound engineer-manager is in many cases the controlling one, and the tendency in such cases is to regard the supply of electricity rather in the light of a profession than in its true aspect, that of a trade. We wish here to emphasise the latter view to the utmost, and to point out that, to an important trade such as this, well-organised publicity and bold advertisement are an absolute necessity. True it is that the merits of electricity are such that, as a correspondent recently pointed out, the trade is bound to make progress, even without the aid of such a scheme; but this in our opinion is a feeble excuse for inertia, and an unseemly one to emanate from a purveyor of *electrical energy*, of all things. Moreover, the enemy have already embarked upon a campaign of activity which puts to shame the advocates of a policy of *laissez-faire* in electricity supply, and which, if the latter do not wake up, may work much mischief.

One of the difficulties to be contended with is the argument that *all* will benefit by such a scheme, including those who do not contribute to its support. This is true enough, but as a serious objection it is not worth a moment's consideration. Putting aside the ethics of the question, and disregarding the jaundiced complexion of those who cannot bear to do good to their neighbour without making him pay, it stands to reason that if all are benefited, those who object will also benefit—why, then, do they object? As for the difficulties imposed by the auditors, which prevent direct contribution to the funds of a publicity association—that is one of the obstacles which ought to be removed, and which could be removed if the Institution of Electrical Engineers and the Incorporated Municipal Electrical Association took the matter in hand.

We have said nothing regarding the merits of the particular scheme put forward by Mr. Palmer; but, as it runs on lines similar to those which we have so long advocated, it will suffice for us to express our approval of it in the main. The great thing, however, is to get the subject forward, and to keep it prominently in the forefront as the question of the day, so that the Industrial Committee of the Institution and the other bodies directly concerned may have the necessary support of public opinion, and may be kept up to the mark and alive to the real need for vigorous and sustained action. For that purpose we shall welcome all such papers as aids to the realisation of an effective scheme of publicity.

Artificers in the Royal Navy.

The criticisms which we offered two weeks ago, regarding a pamphlet and a letter sent to us from the Royal Naval Artificer-Engineers' and Engine-Room Artificers' Benevolent Fund, have elicited a number of replies, which will be found in our "Correspondence" columns. It scarcely need be explained that the article did not raise any objection to legitimate claims being brought to public notice through the Press upon fair and proper grounds, but it did denounce "the attempt to force them upon the public, through the Press, upon the questionable grounds" stated in the pamphlet and the letter. A correspondent asks us why we demur to those statements of claims, and the answer is that we find them in important details to be unsupported by the facts. To illustrate this, it suffices to examine the declaration that "we are rapidly drifting towards the serious position of a steam Navy minus engineer officers," and the further inexactitude that "it is notoriously difficult to get candidates to enter for the engineer branch at all." Another correspondent, presumably also a member of the Benevolent Fund, asks us to believe "that, from 1910 to 1915, not a single engineer officer will have been added to the Royal Navy."

Are we rapidly drifting towards the serious position of a steam Navy minus engineers? The current *Navy List* supplies a sufficient answer to that question. We find that in 1911 no fewer than 48 ratings were promoted to the rank of warrant officers as engineers. In 1912, there were 79 similar promotions, and in January of the present year 15 more were added, or a total of 142 since 1910. These are warrant engineer officers promoted from the rating of chief E.R.A. and E.R.A., and also from the rating of mechanician to fill vacancies as they arise on the established list. It has to be remembered that these warrant officers have received a considerable amount of marine training, and they are admirably suited for the duties which they are called upon to perform. The *Navy List* contains a very substantial number of engineer captains, engineer commanders and engineer lieutenants, and the new-scheme officers will next year begin their specialist courses in engineering. In all these circumstances, therefore, we feel obliged to reject the assertion that "we are rapidly drifting towards the serious position of a steam Navy minus engineers."

It is difficult to infer anything of value from the statement of a correspondent to the effect that the present and the past naval cadets loathe and detest the dirt and grease inseparable from the engine room of a ship, and that they dislike marine engineering. Presumably not even a member of the Benevolent Fund has a craving for dirt or a hankering after grease. If the statement is intended to convey that the cadets and midshipmen are adverse to engine room duties, it is not in accordance with the opinions expressed by officers serving afloat, nor is there any valid reason why a cadet trained at Dartmouth and in cruisers should be less attracted to those duties than a cadet trained at Keyham. Again, it is difficult to find argument in the suggestion that "the prospects of internal combustion engines and the probable absence of stokers in the near future call for concentration on the subject of marine engineering," for the question of indecision on the part of cadets in the selection of a branch for specialisation has not yet arisen. A young officer who has passed through the new scheme of education and training may be expected to know at least as much about internal-combustion engines as a member of the Benevolent Fund who may have entered the service as a copper-smith, and he will probably be as well informed concerning them as the average officer of the mercantile service. In other words, the members of the Benevolent Fund would be well advised if they stated their claims upon their own merits, without attempting to prejudice a scheme of training naval officers which has not yet developed sufficiently far to enable them to judge of its results. They plead for sympathy and fairness; they will not secure these virtues by prejudice, and they will but injure what may be a good cause by overstating their case. The artificer of to-day is better trained and better educated than his predecessors, and he must expect, therefore, to have placed upon his shoulders a greater burden of responsibility, in proportion to the increase of power and complexity of ships and armaments. This principle extends to all ranks and ratings, and it is not to be expected that the commissioned ranks of the engineer branch can be indefinitely increased in numbers while there are capable petty officers and warrant officers well able to lend a hand in supervisory duties.

THE USE OF ELECTRICITY AND ELECTRICAL ACCIDENTS IN MINES.

(*Continued from page* 321.)

In the Newcastle district there were two fatal accidents, one caused by a countersunk screw working up and coming into contact with a metal covering, and the other by a broken ammeter carrying current to the casing. "Neither of these accidents would," says the inspector, "have occurred had the apparatus been properly earthed." In one case the earth wire had been accidently removed, but in the other case the installation being new no earth wire had been attached.

In the Durham district there were two fatal accidents underground, resulting in the death of two persons and injury to a third, and one on the surface.

Of the underground accidents the first occurred at Sherburn Hill Colliery, where direct current at a pressure of 550 volts is used for working a coal-cutter, the current being conveyed in two ordinary insulated cables, which were carried to the switchbox, and then to the coal-cutter. Height had been made in the cross-gate way to within two yards of No. 9 gateway, and at this point where the cables were carried past the gate-end the height was only about 3 ft. As soon as height was made, the usual practice was to carry the cables across the gate-ends in wood boxes, so as to be well clear of the tubs. At the time of the accident this had not been done, although the wooden box was lying ready. It is probable that when a putter named Ashworth (the injured person) came out of No. 9 gateway with a full tub, a large coal on the tub caught one of the cables and dragged it slack, and that shortly afterwards as Ashworth was pulling his empty tub by the in-bye end into the gateway, it came in contact with the slack cable and jammed it against a projecting portion of the gateway, resulting in an abrasion of the insulation, and the core of the cable came in contact with the iron tub he was engaged with. He was knocked down and found with one foot lying across one of the rails. At the same moment another putter named Laverick, who was sitting on one of the tramrails in the cross gateway about 10 yards distant, also received a shock, and was severely burnt about the head and bare parts of his body, and in spite of continued efforts to restore him, was found to be dead. Ashworth recovered after about 40 minutes' treatment. A pony was standing attached to the full tub which Ashworth had brought out, but it took no harm, as the tub was not in contact with the tramrails, all four wheels being off the way. The tubs were of iron, and evidently Laverick received a shock, the current passing through the tub Ashworth was pulling, and then through the tramrails. The cables were suspended by leather slings secured to props, or by wooden supports. The obvious remedy to prevent such an occurrence is to provide more height at gate ends where cables are carried across, and the latter should be laid in boxes, where they cannot come in contact with tubs or ponies. Special Rule (of the code of rules recently superseded) 28 appeared only to apply to the protection of cables on main haulage roads, but the principle is the same, as an insulated cable in such a cramped position is more likely to suffer damage than on a roomy engine plain.

The second accident occurred at Lumley Third Pit, in connection with a coal conveyor. The conveyor in question was a Blackett conveyor, driven by a 6½-H.P. motor of the squirrel-cage type. The current supplied was three-phase, the pressure at the terminals of the supply transformer being 400 volts. On the day of the accident a deputy received a slight shock about three-quarters of an hour after the motor had been started. It was accordingly stopped, and a message sent to the surface for an electrician, who found on examination that at the point where the trailing cable was connected to the motor a loose strand of wire from one of the leads at the terminal block had worked through the insulating tape, and was making contact with the frame of the motor. This was rectified, and the motor restarted. Four hours afterwards the deputy, as he was going along the mothergate, heard a humming noise on approaching the motor, and at once shut off the current at the gate-end box. He then found the conveyor attendant lying unconscious and face downwards between the tramrails at the delivery end of the conveyor. He at once gave an alarm, and artificial respiration was tried for 1½ hours until a doctor arrived and pronounced life extinct. Provision was made to earth the conveyor to bank, and subsequent tests showed that the earth provided was fairly good. The earth wires also were found on inspection after the accident to be efficiently attached. The accident is thus most difficult to account for, and one possible explanation appears to be that the conditions when the accident occurred, and afterwards when the tests were made, were not the same. A loosely attached earth-wire would explain the occurrence; or it might be that the earth connection, though good, was not good enough, and the motor frame was therefore enabled to assume a potential sufficiently high above the surrounding ground (which was wet) to cause the accident.

The surface accident took place on the screens at Trimdon Grange Colliery, and caused the death of a screenman. The current was three-phase at 220 volts, and was used for lighting purposes. At the time of the accident, the deceased was in the act of using his handkerchief to clean the thick protecting globe, which surrounded an incandescent light bulb. The wires to the lamp were carried in an iron tube, at the end of which was an iron lamp shade. As the deceased was cleaning the globe he suddenly fell backwards, and on being asked what was the matter, he said he had "touched that globe," evidently associating in his own mind the action of touching the globe with the state of his sudden collapse. He immediately became unconscious, and efforts to restore him by artificial respiration were persevered with for 1½ hours without success. A post-mortem examination showed that the cause of death was a diseased mitral valve, but there was no direct evidence to prove that the deceased had received an electric shock. An exhaustive investigation of the accident did not afford any satisfactory result, as no actual leakage could be afterwards discovered, though the insulation of the whole circuit was low. No mechanical damage of the wires could be found, which would have accounted for the iron pipes which contained them becoming live. The pipes were supposed to be earthed by an earth wire connecting them to some cast-iron piping of a coal-washer, but it was evident the connection to earth was not a good one. The accident happened after some heavy rains, and the conditions existing at that time were more favourable to leakage than they were when the tests were made by Mr. Nelson, H.M. Electrical Inspector. It is probable that death was due partly to the fact that the deceased had a diseased heart, and was therefore unable to withstand a shock which might not have proved fatal to a person with a normal heart, and also to the fact that the damp conditions existing at the time were favourable to a temporary breakdown of the insulation.

Three ponies were killed by electric shock by two accidents. On the first occasion two ponies were electrocuted, the initial cause being the breakage of one of the armature-end connections in the motor of a Morgan-Gardner coal-cutter, thus rendering the framework of the machine alive. The current was 500 volts continuous, and the trailing cable contained the earth wire. Unfortunately the person in charge of the machine had neglected to tighten up the screw of the earth wire by which it was connected to the metal frame of the reel. The reel had been left standing across the tramrails, and a pony coupled to an iron tub received a shock and moved towards the reel, and is supposed to have got on to one of the cables and pulled the connection plug out of the reel. Another pony on reaching the gateway also received a shock through the rails, tub and gears, and was also killed. An earth wire was afterwards continued from the earth wire of the out-bye armoured cable and taken into the switchbox and joined on to the short earth wire from the reel to an iron rod. This additional earth wire afterwards was the means of conveying a fatal electric shock to another pony within a fortnight owing to the parting of the out-bye armoured cable. The coal-cutter motors were subsequently altered and overhauled, and the installation, which was by no means of recent date, put into a more reliable condition.

There were no fatal accidents in the Yorkshire district, but (says the late Mr. Pickering) it is too early to decide whether this is happy chance or whether the potential dangers

of electricity are better realised. Several underground fires originated by arcing of electric cables. Of the latter, one is described, and it might have had serious consequences, as 411 men had to be brought to the surface, 140 of them through smoke. It is thought that the cause of the fire was "arcing at the point where the three-core cable was separated for connection to the switch and fuses. The cable was paper covered, lead coated and armoured with steel tape. As the Inspector says, "Paper is a hygroscopic material, and the lead sheath of cables insulated with paper is designed to keep out moisture. When the cable is split, a proper "dividing" box should be provided to effectively seal the ends. A wrapping of tape was used instead of a box, and it is probable that this was not moisture proof, and that, therefore, the paper became damp and lost its insulating properties."

(To be continued.)

KENT COAL.

By G. LLOYD JONES, A.M.I.E.E., M.I.M.E., Principal of West Ham Testing Laboratory.

A FEW days ago, by the courtesy of Mr. Arthur Burr, managing director of the Kent Coal Concessions Co., the writer was enabled to take samples from the Beresford 4 ft. 8 in. seam, at Snowdown Colliery.

The Beresford is the first workable seam uncovered, and to many central station engineers—those especially in neighbouring districts—it must be of the greatest interest to have put before them data upon which they may judge as to the value of the coal from this new field for steam raising purposes, which is already being put on the market in considerable quantity.

The proximate analyses given relate to run-o'-mine samples taken from the actual working faces. The one was taken from above, and the other from below the 6-in. shale band, which splits the seam midway in the horizontal plane :—

	Above shale band.	Below shale band.
Volatile matter	27·98	28·26
Coke	70·34	69·76
Ash	7·20	6·11
Fixed carbon	63·14	63·65
Moisture (hygroscopic)... ...	1·68	1·98
Sulphur (separately determined)	1·32	1·29
Calorific value (as dried) ...	13,990 B.T.U.	14,180 B.T.U.
Net effective calorific value (as fired)	13.316 B.T.U.	13,454 B.T.U.
Evaporative power (as fired) ...	13·79 lb. of water from and at 212° F.	13·92 lb. of water from and at 212° F.

The results obtained show the coal to be of exceptionally high thermal value, and since the hygroscopic moisture is comparatively low, having regard to the other general characteristics of the coal, it will be noted that its net effective evaporative power, which takes into account the negative value of the moisture existing as such, and that produced by the combustion of the hydrogen in the volatile matters, is but little less than the evaporative power of the dry coal. On the other hand, the coal was extremely tender and would suffer severely through breakage in transit. Its structure is columnar, the columns being of short length, determined by the lines of natural stratification. When broken transversely to the axes of the columns a crystalline fracture was shown with a suggestion of tarriness. The coal taken from above the shale band disclosed heavy lime salt impregnations due to percolation of water carrying these salts through the interstices. Below the shale band the interstitial impurities were markedly less due no doubt to the protection afforded by the hard shale. The volatile matters were readily liberated, and burned with a long, bright, sturdy, somewhat smoky flame, giving sooty deposits. The coal is of a very agglomerative nature, and produces a silver grey, hard, compact, close-grained coke of excellent quality. The ash is of dark purple brown colour and considerable density.

The utility of this coal for general central station purposes must be severely discounted by its friability. The percentage of "fines" must necessarily be very great, even were the coal screened at pit, as it crumbles under the slightest pressure between the fingers, and riddling through the grate bars would be inevitable in spite of its caking properties. For coking stokers it appears almost ideal, and the great density of the ash means that frequent cleaning out would be unnecessary, as the bulk would be proportionately small. If hand-fired, smoke production must result, and frequent levelling of fires would be required to prevent the formation of blow-holes, which would accentuate the trouble.

Although touching upon a rival industry, it may be of interest to mention that the gas analysis shows the coal to be exceptionally rich, giving a yield of 11,500 cb. ft. per ton of 15·1 C.P. by No. 2 Metropolitan burner, or equivalent sperm value 595·4 lb.

The friability of the coal is not detrimental to its value for gas making.

It will be understood that this article merely relates to the Beresford seam, and it may very possibly be that the seams at greater depth, which aggregate no less than 130 ft. in thickness to the 3,000-ft. level, may prove to be harder and less susceptible to damage in transhipment. Several of the shafts being sunk by other companies subsidiary to the parent company, the Kent Coal Concessions Co., are already in the coal measures, and the day is now near at hand when the present staple Kentish industry—hops—will be overwhelmed by coal from the new Black Country, with sunny Margate transformed into the Blackpool of the South.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Artificers in the Royal Navy.

In the current issue of your journal there appears a leading article dealing with the claims put forward by the chief and artificer engineers and engine room artificers for better pay, accelerated promotion, and a minimum pension of £100 per annum for chief artificer engineers. Your method of discussing these claims is, to say the least of it, unsympathetic, if not unfair, and seeing that the ELECTRICAL REVIEW is an engineering magazine, your remarks call for a rejoinder from someone that has an intimate knowledge of the subject, and such knowledge the writer of this letter claims to possess.

You state at the outset of your article that the subject which you discuss has nothing to do with "the old trouble concerning engineer officers." Well, it has, and it hasn't. In so far as the old trouble was the offspring of class prejudice and arrant snobbery, the grievances of the engine room artificer class are of the same order, but to pursue that aspect of the question would encroach too much upon your space.

You state that the "plea put forward by *certain* (italics are by the writer) discontented, &c." Why, may I ask, do you set out to weaken the plea by making it appear that a mere handful, and these a "discontented" handful, are pushing their claims for further recognition, when further on your article claims to speak for the "great body of artificer engineers"? There is only one organised body of chief and artificer engineers and engine-room artificers, and it is this organisation which issued the plea which you have fallen foul of. It must be assumed that these responsible men know where the shoe pinches, and so suggest a remedy so that conditions of service for them may be readjusted and modified. You admit that the several points enumerated in the plea are "legitimate" ones, but demur to them being forced upon the public through the Press. Why? may I ask again. A few weeks ago, columns upon columns of special articles appeared in the Press advocating higher pay

for lower deck ratings, and it is to the everlasting credit of the Press that it took such an altruistic attitude on behalf of an overworked and underpaid body of men as those included under the general term of lower deck ratings.

After admitting that the grievances put forward in the plea which you criticised are, as abstract propositions, "legitimate" ones, you proceed to state that the pamphlet "must entirely alienate the grumblers from the sympathy of those who have more than a superficial knowledge of service matters." Here again you emphasise what I must describe as prejudice against the large body of men whose views and aspirations are voiced in the plea with which you dealt so caustically.

There are grumblers and grumblers, and there is an offensive way in which the adjective can be used, which makes its use so dangerous. Its use in a professional organ, and on such a subject, is to be regretted.

But to more serious points in your indictment. You describe the statement:—"We are rapidly drifting towards the serious position of a steam Navy minus engineer officers" as a "loose and inaccurate statement," but you fail to show wherein is its inaccuracy. A more generous-minded critic might have passed what is condensed into the broad generalisation about a steam Navy minus engineer officers. It may be crudely worded, but in essence it is true. The last Keyham-trained engineer officers joined the Navy as sub-lieutenants in 1910 (there were 10 of them); and, according to your own showing, it will be 1915 before any of the common entry officers are sufficiently specialised in engineering to be drafted into the service for engineering duties. What of the five years' hiatus? Where are the engineer officers to supply wastage and the normal expansion of the Navy? Further, will there be a sufficient number of these "specialised" (I hope you like the word, though it doesn't sound engineery) officers to go round—*i.e.*, to relieve chief and artificer engineers who are now doing the duties formerly carried out by Keyham-trained engineer officers? Yes, *actually* doing those duties.

So much for your charge of looseness and inaccuracy. You further state that it is misleading to link up the artificers with the commissioned ranks. In fact, you say that it is "unfortunate." May I again put the query mark after the word why? The Admiralty has no hesitation in linking them up. At the present moment there are 23 engineer lieutenants who at one time were artificers, and 636 chief and artificer engineers who served in the same humble but responsible capacity. There is little differentiation amongst ranks and classes when duty is being performed, and it is only sticklers for gradation that refuse a place in the sun for the engine-room artificers. However, your article finishes on a sound note by stating that you think that the lower commissioned ranks will be replenished from amongst the most deserving of the warrant officers. In conclusion, it appears to the writer of this letter a great pity that the engine-room artificers should have received a blow in what, it was hoped, was the house of a friend. Society, and other flippant and irresponsible organs can criticise as they like, but when an engineering magazine takes to that genial art in an ungenial manner, it causes sorrow and disappointment amongst those who expected different treatment.

W. Stoddart,
Ex-Chief E.R.A.

Southsea, *February 18th*, 1913.

I have read your criticisms on "Artificers in the Royal Navy," and I should be glad if you would allow me to reply.

You state that if the artificers forward their application for increase of pay, promotion, &c., to the proper authority, it will receive attention. Well, Sir, since 1882, the artificers have been asking for this *same* rise in pay and prospects, without success, and therefore in justice to the great body of artificers, is it not time an appeal was made to the general public?

With regard to the shortage of engineer officers, it cannot be denied that from 1910 to 1915 not a single engineer officer will have been added to the Royal Navy, and at the same time a very large number of engineer commanders will have retired (this year 23 are due to retire). This, in conjunction with the large and powerful ships being newly commissioned, proves beyond any dispute the serious shortage of engineer officers.

As to the lack of volunteers for specialising in engineering, anyone with the slightest acquaintance with the present or past naval cadet knows how much they loathe and detest the dirt and grease inseparable from the engine room of a ship, and if you heard the remarks that are made by them regarding marine engineering, I venture to think you would feel doubtful as to the success of the scheme.

I must confess it is a surprise to me to read an article in a technical paper upholding a system which can only produce a jack-of-all-trades; surely there is sufficient to study and master in the profession of engineering without introducing such subjects as navigation, gunnery, &c. The complication of modern warships, the prospects of internal combustion engines and the probable absence of stokers in the near future call for concentration on the subject of practical marine engineering, and if the young cadet is only undecided as to what he shall specialise in, it will not tend to produce the best or most efficient engineers.

Might I point out that the whole of the mercantile engineers are exactly the same class and type of men as the artificer engineers and engine-room artificers of the Royal Navy? It is only since this scheme has come along that commissions in the Royal Naval Reserve have been refused to valuable officers of the mercantile marine, and it is curious that, although some 300 were considered to have sufficient professional knowledge to receive commissions, now it is impossible for any mercantile engineer to receive a commission, while, on the other hand, upper-deck officers of the merchant service are being made lieutenants on the active list.

The fact remains that the engineering profession is looked down upon by large numbers of officers in the Royal Navy.

As an engineer in the Reserve, holding an extra first-class engineer's certificate, with some experience in the Navy, I say that, in the artificer engineers and engine-room artificers, the country has sufficient practical engineers to take complete charge of the engine rooms of the whole of the ships in the Navy, and I feel confident that, should the time arrive for them to prove their worth as engineers, they will acquit themselves with credit to their cause and their country.

R.N.R., M.I.Mar.E., A.M.I.M.E., &c.

Your leader on "Artificers in the Royal Navy," in the issue of February 14th, calls for some comment from those you unfairly designated "certain discontented ones, and misguided few."

I say unfairly, because the implication is that the contents of that "remarkable" pamphlet, so adversely criticised by you, were not approved by the great body of those ranks and ratings enumerated therein. It may, however, interest your readers to know that the Benevolent Fund members number not less than two-thirds of the total of artificer engineers and E.R.A.'s in H.M. Navy—a number which is considered fairly representative of the corps, and sufficient at least to warrant the formulation of demands for their special benefit, yet of great importance also to the general efficiency of naval service.

Moreover, the "abstract propositions that are all legitimate" *have* been duly made to the proper authorities, and received careful consideration. But more than that is necessary to ensure success, and the Navy, being "in effect a secret service," only leaves one other method available for pushing demands and interesting public opinion, viz., the Press, which, generally speaking, is favourable.

The impracticability of sending out an accompanying explanatory volume of detail will be recognised, and it is sufficient here to say that the facts stated are unimpeachable. A reference to the official current Navy list will at once show that there are no officers—except artificer engineers—available to even fill up the ranks of engineers retiring every month; and all that is asked is that consideration may be given to the claims of those who are already performing the duties of, and are borne in lieu of, engineer lieutenants in many ships.

Artificer engineers and E.R.A.'s will be quite content if, as you suggest, the way is left open for "those who can climb to the higher ranks," and are quite prepared to fulfil any conditions to that end, outside of the monetary qualification imposed on cadets.

Trusting you will give publicity to this addition to "the scanty information available" hitherto, and thanking you in anticipation.

C. J. W.

Devonport.

[This correspondence is referred to in our leader pages. —EDS. E.R.]

Fixing Contacts in Springs.

In your issue of February 14th, 1913, I noticed under the above heading a device by Mr. S. E. Srawley, of Liverpool, which, indeed, is a great improvement on the old method of cutting the wire into bits and inserting them by means of a pair of tweezers.

Your contributor could, of course, not have been aware that a similar tool of my design, also for a small handpress, has been working in a London factory this last six years very successfully—producing 2,500 to 3,000 springs per day, of any kind.

This tool includes piercing the hole, feeding in and cutting the wire, forming a single point, double point, single flat and double flat contact, as required, and finally throwing out the spring automatically into a box by the side of the press, each spring being picked up once only.

A second and much improved tool for the same purpose is now also at work in another London factory.

Should any firm be interested in the above, I shall be pleased to furnish further particulars.

M. W. F. Petmeky.

London, N.W., *February 20th*, 1913.

Testing the Continuity of Earth Conductors.

With reference to my letter of the 3rd inst., in reply to "Continuity," kindly grant me further publicity in reply to Mr. J. P. C. Kivlen.

In my reply to "Continuity," I simply dealt with a method of testing an earthing system for continuity to the earth connection.

As regards the class of cable and the arrangement of the earthing systems, before dealing with this matter, it would be necessary to consider the circumstances of each individual case. I presumed the regulations in regard to the conductivity and continuity of the earth conductors were fully understood, and there should be no difficulty in complying with the rules. Provided this is done, all that remains is to maintain the efficiency of the system by careful inspection and tests from time to time.

Now, with regard to the method of testing. Mr. Kivlen seems to look upon the "bridge" test with awe, and I do not quite follow him when he refers to the expense of a few thousand gallons of water and a few tons of coal; but I assure him that the tests are easily made, and even the cost of a single life may be avoided.

Referring to Rule 14, sub-Sec. (*c*) (i), Mr. Kivlen states that this does not call for a "bridge" test, or any definite measurement at all; he further states that a continuity test can be taken by joining one of the copper conductors to the armouring at the far end of the cable, and testing by "Megger" or galvanometer from the same conductor to the armouring at the near end. I say that to rely upon a test of this description is simply asking for trouble, and I would much prefer to risk inspection only.

The "Megger" or galvo. would, no doubt, show perfect continuity, but 5 or 10 per cent. of his load current on the earth conductors would probably show some serious defects in the continuity of his earthing system. This is an important point, and, I believe, has been the cause of several fatal accidents.

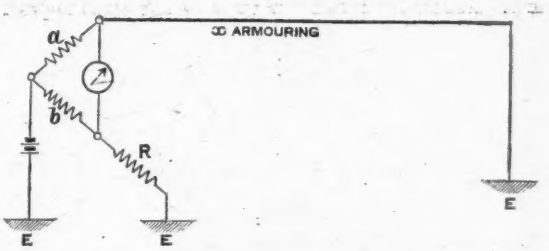
With regard to an expensive insulation testing ohmmeter and generator, no damage need be feared, but the instrument is practically useless for such a test.

A more reliable test can be taken on similar lines, which is practically a conductivity test, by supplying current to the cable and armouring with voltmeter and ammeter in circuit. Then the fall of potential across the ends of the conductors will give the resistance by Ohm's law, viz.:—

$$\text{R} = \frac{\text{drop in volts}}{\text{current}}.$$

This is a simple method, and should appeal to the "Small Colliery Electrician" referred to by Mr. Kivlen.

Mr. Kivlen states that my method does not test the continuity of the earth conductor. I take it he means the whole length of conductor. This can easily be done when the arrangement of the system is known, and may be applied in his case as follows:—



Thus the total res. x of the line and earth is $\text{X} = \text{R}\,a/b$.

If the cable be used as a second line the res. of the earth conductor can be determined separately from that of earth, as well as the res. of earth.

Let r = res. of first line, r_1 = res. of second line, r_{11} = res. of earth.

Connect the far end of r and r_1 together to get the total resistance R; connect r and r_{11} and measure res. R_1.

Connect r_1 and r_{11} and get the total res. R_{11}

$$\text{Then if } \text{T} = \frac{\text{R} + \text{R}_1 + \text{R}_{11}}{2},$$

$$r = \text{T} - \text{R}_{11},$$
$$r_1 = \text{T} - \text{R}_1,$$
$$r_{11} = \text{T} - \text{R}.$$

I note that Mr. Kivlen agrees that it is necessary to test the earth itself, although he states that the rule does not call for it. The rules, however, refer to the Board of Trade Regulation, which requires two earth-plates to be laid and maintained, so as to secure electric contact with the general mass of earth, and so that, if possible, an E.M.F. not exceeding 4 volts shall suffice to produce a current of at least 2 amperes from one earth connection to the other, through the earth—a test to be made once every month.

It was pleasant to find Mr. Kivlen finally coming over to my side by means of a "rapid" bridge test. But why "rapid?" A continuity test may be taken on the earth conductors at any time without disorganising the system, provided, of course, there is no serious leakage disturbance.

I am glad to have had the opportunity for discussing the subject with Mr. Kivlen, and hope to see further correspondence on the subject.

B. T. Davies.

Swansea, *February 17th*, 1913.

In further reference to the subject of mines regulations and the continuity of earthing conductors, the point I wished to emphasise, but which, perhaps, I did not quite make clear, appears to have been lost sight of by most of those taking part in this interesting correspondence—that is, the 50 per cent. conductivity at all joints, as required by Rule 8 (*b*). My object in writing was to open a controversy on this subject with a view to an exchange of opinions on this important matter.

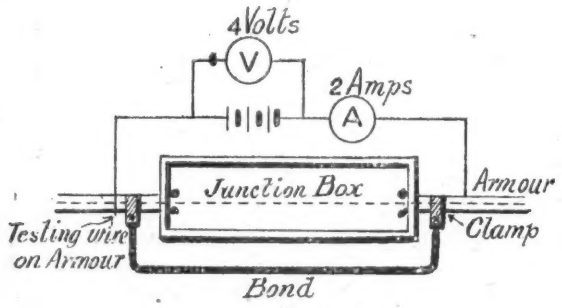
I take it for granted that a modern colliery installation is provided with armoured cables that comply with the recommendation of the Engineering Standards Committee, so that the question of continuity and conductivity of the actual armouring is assured.

I cannot agree with Mr. Kivlen where he says: "This does not call for a 'bridge' test or any definite measurement at all." Rule 8 (*b*) clearly states that some definite measure-

ment is required to prove that there exists the required 50 per cent. conductivity. The question arises, is the connection between the armour or clamp at each side of a junction box sufficient to ensure a 50 per cent. conductivity? I am confident, provided a clean and tight connection is made, that it does, but what is required is a ready method of testing to prove this beyond doubt.

The galvanometer or "megger" test does not necessarily prove continuity if the armour is in a damp place, and conveys no idea of the conductivity of the earthing system.

To ensure the best possible earth at the surface of the mine, I have sunk two earth plates at a distance of 25 ft. apart in wet clay, surrounded by small coke, but I cannot get above a 25 per cent. conductivity between the two plates, although I agree that a good earth at the surface is most desirable. I think it quite as important to provide



additional earth plates or connections to pump suctions in the mine, although I can only get a 25 per cent. conductivity between my two surface plates, I can get 100 per cent. between my earthing system and absolute earth taken off the surface water supply pipe.

I should like to suggest a method of testing the continuity and conductivity of joints in the earthing system that does not require any interference with the line conductor and does not interrupt the supply, namely, the one referred to in the memorandum on Rule 8. This method may be open to criticism, but I think as it meets the requirements of the Light Railway orders and merits mention in the memorandum of testing earth plates, it might be usefully applied for periodically testing the conductivity through junction boxes, &c.

I should like to see the merits or demerits of earthing the mid-voltage point of a medium-pressure direct-current system discussed through the medium of your columns.

Continuity.

Norton, *February 24th*, 1913.

Mr. H. Field's communication is, perhaps, just a little inconsistent. If he follows the correspondence closely he will find that I replied to a question that had a direct bearing on cable armouring, and on nothing else, Rule 12 (*e*). I later proceeded to interpret Rule 14 (*c*) (i), and, in this instance, I did not deal with cable armouring as the predominating factor, as your correspondent states. I dwelt on the importance of testing the "earth," the one "earth" that the Home Office recognises—the proper discharging device at the surface. Both taken conjointly give the best means of complying with the rule.

He has a cable to the bottom, and goes in-bye hanging on pumps, haulages, &c., showing no distributing system to speak of. The conditions, of course, might allow of nothing else. Under certain conditions it is bad practice, and does not allow of proper discriminating devices being installed. Now, Rule 14 (*c*) (i) tells him to examine the apparatus, &c., and surely, if he has proper bonding devices, he can do this with the sense of sight and feeling, and discover a fault if one exists. If he has 50 natural earths in the pit it does not prevent him from testing the continuity of his armourings from one or all of his machines right to the surface. Then let him, if he will, disconnect his main earth cable, the one running to the earth plates at the surface, and test the value of his plates with the surrounding soil by the method I have shown. The Home Office give his earth conductors an absolutely definable resistance, and he should know this value. This applies, no matter what the conditions, in three-phase work. It is theoretical, of course, but with joints, &c., if it is not more than 100 per cent. higher, he will do very well.

I could test 50 natural earths in the pit by a little discrimination, either by the method put forward by Mr. Davies or myself. The point is, how can you stop the plant to do this or any of the tests? If he now tells me whether his neutral point is earthed or clear, I will point out to him a means of defining the earth that tripped his switch.

John P. C. Kivlen.

Uddingston West,
February 22nd, 1913.

The Use of Electricity in Mines.

The article dealing with "The Use of Electricity and Electrical Accidents in Mines" in your last two issues was both instructive and interesting, and I note the recommendations put forward. It would further interest me, and I believe a great many other readers, if the writer of the article would give a general outline as to how he would carry out the following scheme :—

Incoming supply from supply company at 11,000 volts carried down shaft 300 fathoms to sub-station at bottom, with four coal-cutters which operate at the same time at 200 volts in a 22-in. seam, 1½ miles from the bottom. Power not being used elsewhere in the mine.

J. S. Walker.

Tollcross, *February 26th*, 1913.

"Life Understood."

I have always had a warm corner in my heart for the Electrical Review, and those connected with it, dating from the time when, as a young man, I used to read it through regularly every week, including such advertisements as were new to me. I am, therefore, writing a letter dealing with the review that recently appeared in your paper on a book called "Life Understood," of which I am guilty of being the author, hoping that the letter may be of the use to your readers that many letters and articles in the Electrical Review were to me in the days gone by.

The main point made by the reviewer was that the point of the book was elusive. I am not quite sure what he took as the main point of the book, for different readers might choose different points according to that in which they were interested, as the book claims to have cleared up all occult phenomena and put them on a scientific basis. I think we may, however, take the main point to be "What is Life?" I point out clearly in "Life Understood" that every man appears to be a material being liable to sin, suffering and sickness, but that he is really a perfect being in a perfect world governed by a perfect God, and that he is being humbugged and fooled and hypnotised to believe that the material being is him, whereas the real spiritual man is the only real man, and he has life eternal, the matter having no life but being merely illusionary phenomena, like a series of cinematographic pictures.

In the Bible we are told in many places that we are Sons of God, and yet Jesus said, "Ye are of your father the devil." I point out that, mathematically speaking, Heaven is a world of four dimensions, and that we see only three dimensions of it, and therefore see it all wrongly. The love, the life, the wisdom, the joy, the knowledge, in fact, everything good that you see about a man is heavenly, part of the real spiritual four-dimensional man; whereas the sin, sickness, troubles and sorrows are of our "father the devil," and are merely a series of cinematographic pictures that flash by in front of the real man and hide him from us. It is for this reason that the psychometric and prophetic results are obtained, as it is possible for the human being to get in mental touch with these cinematographic pictures, and see what is about to happen or what has happened. When you know how to think rightly you can destroy the evil in these cinematographic pictures, and it will not be manifested.

The above facts are capable of proof, and no one need

take what I say, as they can prove for themselves the facts set forth in "Life Understood."

Another objection is that I deal with "things metaphysical." This is true, because I point out that metaphysics, science and religion must all agree when their mistakes are corrected.

We have until recently believed that matter is an indestructible thing. If this be so, matter, and therefore sin, sickness and trouble must exist for ever. Now, I point out in "Life Understood" how matter, being electricity, can be caused to appear and disappear scientifically in two different ways, and I show the two ways in which this can be done, one by altering the electrical tension, which can be done hypnotically, the other by the action of God, the principle of good which short circuits the lines of force of which the ether is composed. These lines of force are identical with what are called "thoughts"; thought being a high-tension electrical current, and matter, from a metaphysical point of view, a manifestation of thought.

The reviewer says:—"The author has certainly written a book that is unique. He deals with a vast array of subjects, but not always with the pen of a specialist. For instance, hypnotism, according to his idea, is everything that is bad and useless. He does not seem to be aware of the wonderful mental cures that are being effected every day by means of this truly extraordinary science."

I dealt with a "vast array of subjects," as they all confirm the statements put forth and show that when a man really knows what the facts of life are, such results as are obtained by sorcery, spiritualism, hypnotism, faith healing, thought reading, clairvoyance, and last, not least, how Jesus did his miracles, become easy to understand.

With regard to hypnotism, which is merely the power of one human mind over another, if the reviewer had been able to give more time, he would have found not only that in "Life Understood" do I deal fully with hypnotism, mentioning that there are "five different forms of hypnotism, all of them wrong," but that I show the reason why, to use his words, it is "bad and useless," and further show the proper method of mental working whereby evil and matter can be always destroyed, and not only the person helped that a man was endeavouring to help, but the one mentally working, instead of being harmed, as in the case of hypnotism, is improved mentally, physically and morally. I can deal best with this one point by saying that the man who is probably the leading medical authority in the world on the human mind, asked me not long ago whether I would help one of the three leading hypnotic doctors, who by his work had got himself into a very bad state of health, and he thanked me sincerely when I promised that I would do this.

In "Life Understood" I point out that hypnotism and its results have been known for centuries, and that the results obtained by witches and sorcerers in olden days were merely hypnotic. To-day these results are said to be due to hypnotism and mental suggestion. I deal fully with psychotherapy, and also give a list of results obtained through hypnotism, and the names of some 30 of the leaders from Kelmont up to the present time.

With regard to spiritualism, I do not think that "the treatment is somewhat general," as I give not only the scientific reasons for the results obtained, but show in detail the different classes of results that can be obtained by so-called spiritualism, and also point out that it has nothing to do with departed spirits in any shape or way, but is merely due to the action of the sub-conscious mind of the medium.

It is quite true that in the book there are "weird terms," but the reason for this is that it is always difficult to explain metaphysical matters clearly, until one knows the way in which an author employs his words, and special terms, which in every case have been explained, have had to be used—not coined—in order to prevent confusion.

F. L. Rawson.

P.S.—Since writing the above, I see an article in the *Daily News* in which it deals with some recent statements by Dr. Stenson Hooker in a lecture by him on hypnotism. I have often discussed mental effects with Dr. Hooker, who has come to me for advice at various times, and it will be seen that he clearly draws attention to the dangers and abuse of hypnotism.

If it is capable of abuse, and everyone must admit this, it is fundamentally wrong. Working mentally in the proper way, no harm can possibly accrue to the healer or patient, and good must always be done.

THE SOUNDER IN SUBMARINE TELEGRAPHY.

By EDWARD RAYMOND-BARKER.

Under the above heading, the Electrical Review, in its issue of February 21st, drew the attention of its readers to a matter which—through the medium of practically the whole British daily Press of February 17th—had already riveted the notice of an important section of the public. Reference is here made to the news cabled over from New York Press agencies, relating to the success attending the adoption, by the Commercial Cable Co., of our countryman Mr. John Gott's new principle of telegraph-working: a principle enabling the ordinary Morse, with its attendant automatic-translation facilities, to be worked on long submarine cables.

Before offering further comment, the writer seizes the opportunity to convey to Mr. John Gott whole-hearted congratulation on the success of his invention: one based on a principle which—whatever various means may henceforward be devised or may have been devised by other experimenters—will, throughout future history, remain, and ever will be recognised as wholly and entirely his.

Any one of Mr. John Gott's large circle of friends will rejoice in the realisation of his ideas, and in the overcoming of difficulties ever present in the practical carrying-out of instrumental details.

The concept of utilising the cable discharge, after each dot or dash of a Morse signal, to cause a switch-over to a reverse battery polarity, is simple as well as ingenious, and it is a combination of these two attributes which marks the true genius. The consequent close succession of signals, whether dots or dashes, of alternate + and − polarity, not only tends, during the progress of a letter or of a word, to keep a cable in an electrically neutral condition, but discourages distortion.

Now that, through the Press, the nature of the Gott principle has been disclosed, various experimenters out of sheer personal technical interest will bring out other devices for the carrying-out of the Gott principle. The writer had two of his own, one of which was suggested to him by mechanism devised by a friend for a "wireless" steered submarine torpedo. One of these is a purely mechanical "step-over"—to and fro—action. The other is electro-magnetic. But whatever may be the device by which the current is automatically reversed on the coming to rest of the Morse key after the transmission of any one dot or dash, the principle—and it is that which matters—is covered by the patents taken out, so the Press informs us, in all countries.

The writer would not have ventured to discuss technical details, had not matter sufficient to warrant discussion already appeared in the technical Press.

So far the writer has dealt with this subject solely in its bearings on the distinguished inventor. One may rest assured that Mr. John Gott is in no way responsible for the wording of the messages emanating from New York Press agencies. The same applies to the gentlemen who, under their eminent President, control in New York the business of the Commercial Cable Co. From these gentlemen, all and individually, the writer has received kindnesses and acts of hospitality that he will never forget. At the same time he has been in New York quite often enough to know how easily exaggerations get afloat.

In this mention of exaggerations, the writer is prompted by the fact that one great point in the Press notices has been the alleged discovery of effective cable Morse, that is to say, of a device enabling a common Morse inker or sounder to be used on a long submarine cable at a good commercial speed. The question instantly arises: "Is cable-Morse quite

unknown?" The writer here refers to cases where the Morse has supplanted the Kelvin recorder.

A highly respected contemporary, the *Electrician* (February 21st) in a leading note, and an interesting descriptive article, gives much the same information as that to be found in the Electrical Review (February 21st), and, elsewhere, indulges in a joke about the advent of cable Morse. On page 166 of the esteemed contemporary's current supplement, emphatic denial is given to a rumour that a magnate (named) in the "wireless" (financial) world, on reading of Mr. John Gott's system, remarked . . . . Well, on second thoughts, the writer prefers not to repeat the words. These may be read in the columns of the contemporary. They evince keen regret on the part of the speaker that the business likely to accrue from the new system had not come his way.

To return, however, to the question as to the progress already made in cable Morse—a method of working, according to practically all the Press notices, now for the first time rendered feasible. Is it just, then, that we should ignore the work of the late M. Pierre Picard, of the French Government Telegraph Service? Mr. John Gott would be the first man to give an emphatic negative to this question.

According to the *Comptes Rendus de l'Académie des Sciences*, of Paris, on December 21st, 1903, a Commission nominated by the Académie unanimously voted the "Prix Hughes" to M. Pierre Picard for telegraphic improvements, resulting not only in a greatly increased signalling speed on the cables, but in rendering feasible, on the French Government Marseilles-Algiers cables, the use of rapid Morse, and of the Hughes and the Baudot printing systems. Hitherto siphon recorders had been used. On the Oran-Tangiers cable, too, Picard-Morse had been adopted with—when press of traffic required it—Wheatstone auto-transmission.

The writer begs leave to quote from the Electrical Review of September 11th, 1903, certain statements of fact as to M. Pierre Picard's work—work still in full swing between Paris and Algiers, with auto-relay at Marseilles.

". . . . Direct communication between Paris and Algiers by means of the Baudot apparatus. The total length of the line was 1,800 km., of which 900 km. were cable. . . . M. Picard has devised a most ingenious method of employing the periods of *rest* between the emitted currents to produce the signals. The 'tail' of the current, hitherto considered the enemy of the submarine telegraphist, has now been made his best friend. Instead of the length of the current forming the dots and dashes, the signals are made by the length of time *between* the currents. The currents are all of equal length and strength. In the picturesque language of a French engineer: 'On parle, pour ainsi dire, avec des silences.' Each signal is composed of two currents of equal duration, one positive and one negative. Between these two currents, the positive and the negative, a period more or less long distinguishes the dash from the dot. The system can also be applied to printing telegraphs with equal success . . . The transmissions from Paris to Algiers direct were effected by means of translating relays at Marseilles. Paris can employ a four-armed set to Algiers; the arms unemployed at Paris are used at Marseilles. The Central Office at Paris can on occasion give up two arms to the Elysée Office, and the Central Office at Algiers can on its side give up two arms to the palace of the Governor-General, thus establishing direct communication between the offices of the President of the Republic and the Governor-General."

Much more detailed information regarding the Pierre Picard principle of cable working may be obtained from the valuable illustrated articles written by M. le Dr. A. Tobler (Professeur à l'Ecole Polytechnique de Zurich), and published in *Le Journal Télégraphique* de Berne, for December 25th, 1903, and January 25th, 1904.

From this source we learn that, in 1898, when still the Kelvin recorder was worked on the three Marseilles-Algiers cables, increase of traffic appeared to necessitate an additional cable. However, the adoption of the Baudot, made possible on the cables by Picard's method of transmitting incipient impulses of alternate polarity without earthing the cable at the sending end, obviated the necessity for a fourth cable. In fact, since the adoption of the Picard-Baudot, the three cables have largely sufficed for all purposes, and the public receives its telegrams in print, direct from the Paris-Algiers apparatus.

Again, very clear notes on the Picard principle are given in *Le Journal Télégraphique* of December 25th, 1906, by M. A. Carletti. He shows that Picard sought to arrive at absolute sign-alternation, combined with equality in the strength and duration of actual electrical charges, and this without any reference to the duration of an actual signal—that is to say, to the duration of the *interval* between the first impulse of a given sign and the following impulse of opposite sign. What differentiates Picard's principle from all others employed, or tried up to his time, has been his absolute abandonment of any idea of bringing back the electrical condition of the cable to a neutral condition after the application of each charge. Picard has brought about that each transmitted impulse finds the cable in a symmetrically neutral electrical condition. In other words, a + charge finds the cable influenced by a − charge of known value; a − charge finds in the cable a + charge equal to the preceding − charge, and so on.

On cables of "great length," M. A. Carletti remarks, Picard insulates the line after each momentary charge impulse and, according to the nature of the cable, he substitutes, in certain cases, an earthing period of given time value, followed by a "freeing."

The writer has attempted, in figs. 1 and 2, to summarise matters.

Fig. 1 compares the Picard and the Gott transmission principles, and shows the word "Picard" in conventional

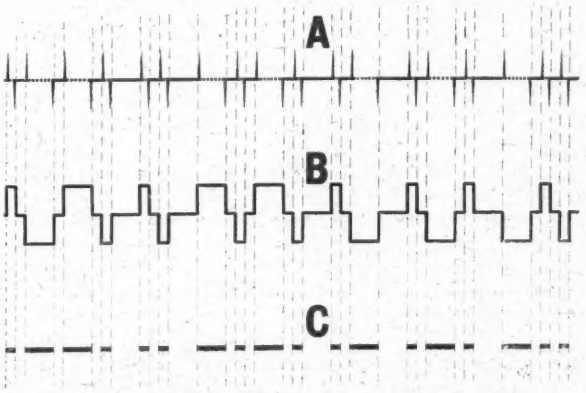


Fig. 1.—Picard (A) and Gott (B) Compared.

graphs illustrative of the two principles, and in corresponding Morse.

Fig. 2 shows what may be termed the master device of Pierre Picard, applicable to hand Morse or to Wheatstone auto, to the Hughes or to the Baudot.

In fig. 2 a simple cable Morse circuit is shown. Continuous lines = main circuit; interrupted lines = local circuits; R_1 and R_2 are two polarised relays; $L B_1$ and $L B_2$ are local batteries.

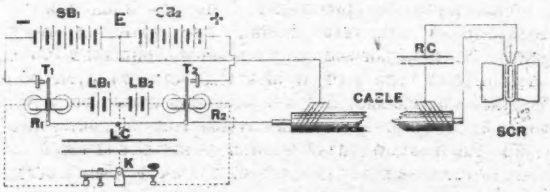


Fig. 2.—Pierre Picard's Cable Morse.

Owing to the presence of the local condenser L C, any depression of key K causes a momentary "kick" of relay tongue T_2 up against its stop contact on the + pole of the sending battery S B_2.

Again, each time K comes to rest after each dot or dash, the relay tongue T_1 makes a momentary contact against its stop contact on the − pole of S B_2.

During the interval between the two relay tongue kicks caused respectively by the depression and the raising of K, the sending end of the cable remains insulated on the electrically connected tongues T_1 and T_2 at rest.

A graphic presentment of the working of the momentary + and − impulses is shown by "A" in fig. 1, which does not pretend to represent the real electrical conditions in the cable.

At the receiving end of the line is S C R, a suspended-coil relay specially designed by M. Pierre Picard. The coil has no self-retractive force, but is absolutely free to respond, in its movements, only to cable impulses.

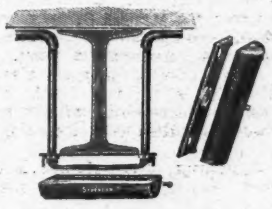


Fig. 1.—Simplex Girder Box.

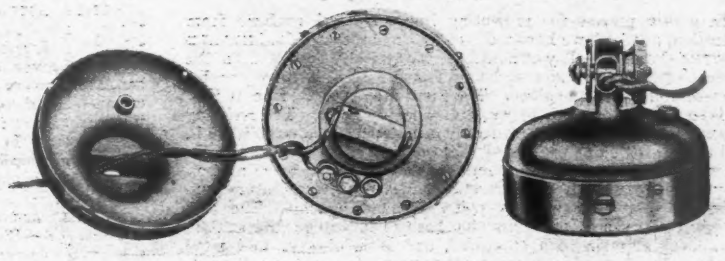


Fig. 2.—Gottschalk Transmitter with Back Casing Removed, and Complete.

Between the relay and "earth" is the receiving condenser R C.

It will be seen that in Picard's system, + and − momentary impulses cancel out, whether in a signal, a letter, a word, or 1,000 words.

The Gott system of transmission, illustrated in B (fig. 1), if subjected to similar analytical treatment, gives interesting results, showing a certain + percentage of overcharge in some cases, and − percentage in others, but balancing out very evenly on the whole.

Results are here given of electrical analyses applied to the following sentences transmitted on the Gott principle. In each case a start has been made with the + current. The dot has been taken as unit.

"The Commercial Cable Co., of New York, United States of America."

(+) units = 151, (−) units = 126, overcharge = 19·8 (+) per cent.

"The Telegraph Construction & Maintenance Co., of Greenwich."

(+) = 134 : (−) = 133. Overcharge = 0·75 per cent. (+).

"Siemens Bros. Dynamo Works, Ltd., Stafford and London, England."

(+) = 129; (−) = 143. 10·9 per cent. (−).

"The India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd."

(+) = 133; (−) = 121. 9·9 per cent. (+).

The simple alphabet without accented letters, &c.

(+) = 87; (−) = 71. 22·5 per cent. (+).

Figures 1 to 0 inclusive :—

(+) = 45; (−) = 55. 22·2 per cent. (−).

Taking the sums of the foregoing :—

(+) = 679; (−) = 649. Overcharge = 4·6 per cent. (+).

The question remains: To what extent is the Picard principle—so successful in the Mediterranean—applicable over average Atlantic and Pacific cables? Here, at any rate, lies an untrammelled line of legitimate investigation open to all.

It has been shown how Pierre Picard was honoured by the Académie des Sciences of his country. May the writer be allowed to express the hope that equivalent or greater distinctions will be conferred in London and in New York, on John Gott, the British inventor of the London—New York cable Morse.

Inquest.—The funeral took place last Friday at Acton cemetery of Mr. Charles Ellis, an electrical engineer, employed by the Great Western Railway Co. Deceased was 50 years of age, and a member of the London Railway A.A., to which he had rendered assistance by the erection of a special telephonic service for the facilitation of the meetings at the Stadium and at Castlebar Park, Ealing. The deceased died suddenly, and at the inquest the medical evidence showed that he was in the early condition of pneumonia, and there was dilatation of the heart, which produced syncope. A verdict of death from natural causes was returned.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Conduit Girder Box.

In a supplementary sheet (T 3), Messrs. Simplex Conduits' Ltd., of Charing Cross Road, W.C., give particulars of two new conduit accessories—their patent girder clip and girder box. The latter, which we illustrate, is a neat arrangement for carrying conduits around girders in factories, &c. Where it is required to drop a light from the girder, the box can be provided with a porcelain connection piece and a cord grip at a small extra charge. It is stated that the box itself is practically equivalent in cost to the two inspection bends which in the ordinary case would be used. The box has a cast base, which projects over the sides of the cover, preventing any moisture draining off the girder from penetrating inside the box. A rubber or leather washer should be used between the underside of the base and the lock nut.

The Gottschalk Telephone Transmitter.

Practically all the commercial types of telephone transmitter have employed the same type of diaphragm as was found in the very first instruments designed. The Gottschalk transmitter, however, is the result of over five years' careful investigation of the properties of vibrating diaphragms. Instead of employing a loose diaphragm made of some dead metal, such as aluminium, which is commonly used for the purpose, phosphor-bronze is employed, which is rolled to produce an initial tension. The diaphragm is then formed, without drawing the temper, into a pan-shaped disk, the projecting edge of which is securely clamped, leaving the central portion free to vibrate like a drum-head.

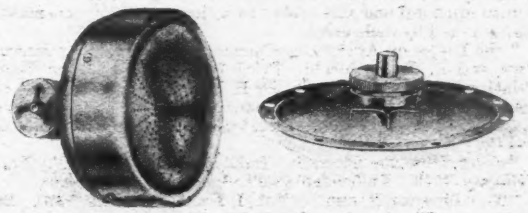


Fig. 3.—Gottschalk Transmitter, and Diaphragm.

A resistance cell of the ordinary type is connected to the centre of the diaphragm by means of a spider-shaped member having a number of feet, which are soldered to the inner surface of the diaphragm (fig. 3). These feet being equi-distant from the centre, pick up the sound vibrations at the point of maximum amplitude, and it will be noted that this method of connection is entirely different from the ordinary method, wherein the cell is connected to the diaphragm at the centre. The cell with the diaphragm is placed in a back casing, the various parts being illustrated in the accompanying figures. A connection is made between the front electrode of the cell and an insulated terminal carried on the casing, in such a manner that the circuit is confined to the electrodes and granular carbon, so that no part of the casing or diaphragm is in circuit.

Certain other details of construction result in an instrument which is absolutely watertight, as it may be immersed in water for hours, or even days, without any damage whatever. The casing being of brass and the diaphragm of phosphor-bronze, there is no corrosion such as commonly occurs in transmitters where aluminium diaphragms are employed.

As the sensibility of the instrument is considerably increased by the improved diaphragm construction, it is possible to dispense with the usual mouthpiece. Telephone companies figure, especially in the case of desk sets, that the annual maintenance cost for mouthpiece replacement is as high as 2s. per telephone. The Gottschalk instrument eliminates this charge, as the mouthpiece consists of a flat perforated metal guard, which is practically indestructible (fig. 3).

The mouthpiece can be thoroughly cleansed, and as it is flat, it will be often wiped, which is not the case with the usual funnel-shaped mouthpiece. With the Gottschalk instrument the user unconsciously gets close to the flat guard, as there is nothing to repel him, and better average transmission results.

The shell of the instrument is provided with a large drain hole, so that water and moisture can drain off the diaphragm. The latter has no holes or seams whereby moisture can penetrate to the interior.

From tests made in several University laboratories and by Mr. H. R. Van Deventer, this instrument, in its commercial form, was found to average from 3 to 7 miles better in terms of standard cable than transmitters of ordinary construction.

Ferro-zincing or Ironising.

In a new process for protecting iron and steel surfaces from corrosion, of which we have received particulars from Mr. Sherard Cowper-Coles, an alloy of zinc is electrolytically deposited on the surface of the iron or steel to be protected, which is more durable than coating with zinc alone. The great drawback to zinc is that it is so readily attacked by weak alkalies or acids. The resisting power to corrosion of zinc-iron alloy has already been established in connection with the process of "Sherardising," which consists of forming an alloy of zinc and iron on the surface by bringing iron or steel in contact with zinc dust or powder at a temperature considerably below the melting point of metallic zinc. The new process of ferro-zincing or ironising has the advantage that articles of almost any size can be coated, and it is cheaper and more efficient than hot galvanising; as the process is a cold one, there is no distortion.

BUSINESS NOTES.

Book Notices.—*Deutscher Kalender für Elektrotechniker* (Uppenborn's). Edited by G. Dettmar. Thirtieth year. Munich: R. Oldenbourg. Price 5 M.—This handbook, one of the very oldest-established, is issued in two parts, one neatly bound in leather for the pocket, the other in paper covers. The former contains tables, units, elementary principles, measurements, and treatises on electrical machinery D.C. and A.C., batteries, generation and distribution, lighting and power, regulations, &c., with a diary at the end. The second part covers electric traction, telephony and telegraphy, electrochemistry, physics and mathematics. The two together constitute what is practically an encyclopædia of information on electrical and allied subjects in compact form, and must be highly prized by their users.

"The Design of Alternating-Current Machinery." By James R. Barr and R. D. Archibald. Price 12s. 6d. net. "The Baudôt Printing Telegraph System." By H. W. Pendry. Price 2s. 6d. net. "A First Book of Electricity and Magnetism." By W. Perren Maycock. Fourth Edition. Price 2s. 6d. net. London: Whittaker and Co.

"*Journal* of the Franklin Institute." Vol. CLXXV, No. 2. February, 1913. Philadelphia: The Institute. Price 50 c.

"The Physical Review." Vol. I, No. 1. January, 1913. Lancaster, Pa.: The American Physical Society. Price 60 c.

"Atti della Associazione Elettrotecnica Italiana." February 15th, 1913. Milan: Stucchi, Ceretti & Co. Price L. 1·50.

"Einfluss der Scheinenspur auf die Eisenbahn und Kleinbahn-Wagen." By James Sutherland Warner. London: The Warner International and Overseas Engineering Co., Ltd. Price 1 M.

Dissolutions and Liquidations.—The Gilbert Arc Lamp Co., Ltd.—This company is winding up voluntarily, with Mr. W. A. Henderson, 3, Fenchurch Street, E.C., as liquidator. A meeting of creditors is called for to-day. We are asked to state that this liquidation is merely for the purpose of completing the transfer of the assets to Engineering and Arc Lamps, Ltd., of Sphere Engineering Works, St. Albans, Herts.

Crathorne & Green Manufacturing Co., electrical engineers, Wagner Street, Old Kent Road, S.E.—Messrs. J. L. Crathorne and F. J. Green have dissolved partnership. Mr. Green attends to debts, &c., and will continue the business.

Hartlepool Electric Tramways Co., Ltd.—A meeting will be held on March 28th at Electrical Federation Building, Kingsway, W.C., to hear an account of the winding up from the liquidators, Messrs. H. W. Davis & H. A. Stagg.

Light Railways Syndicate, Ltd.—A meeting is called for April 2nd at the offices of the New General Traction Co., Ltd., 8, Crosby Square, E.C., to hear an account of the winding up.

Osram Lamp Patents.—On Friday, February 7th, 1913, in the High Court of Justice, Chancery Division, Mr. Justice Swinfen Eady granted an interim injunction to the Osram Lamp Works, Ltd., restraining the Oro Light and General Supply Co., Ltd. ("Oro" lamps) their servants, agents and workmen from selling lamps infringing Osram Patents Nos. 23,899 of 1904 and 18,622 of 1906. We are informed that the lamps in question were made by the Wolfram Co., Augsburg, Bavaria.

Catalogues and Lists.—Messrs. Laing, Wharton, Ltd., 7, Great Newport Street, London, W.C.—English and French editions of Messrs. Vedovelli, Priestley & Co.'s catalogue of high and low-tension switchgear, for which the firm are sole agents in the United Kingdom.—The English edition consists of 44 pages, and contains excellent illustrations, descriptive particulars, and tabulated prices of various switches, fuses, relays, switch fuses, lightning arresters, limiters, resistances, &c. The French edition (of 72 pages) deals with the same and many additional lines, and contains half-tone illustrations of overhead high-tension lines, electric railway overhead construction work, electric luminous fountains, &c.

Mr. George Ellison, Victoria Works, Warstone Lane, Birmingham.—Illustrated sheet, No. 500/1, containing a full description of their new drum type controllers for cranes, hoists, &c. They are now manufacturing controllers, both for D.C. and A.C. circuits, and several new features are embodied in the present design, one being the very large space allowed for connecting up.

Messrs. Aiton & Co., Derby.—Catalogue of between 30 and 40 pages, containing a great deal of information useful to engineers, relating to flanged pipes and accessories. Tabular prices and diagrams are given of cast-iron pipes, wrought-steel pipes, expansion bends and steam separators, table and hanger brackets, automatic exhaust relief valves, and high-pressure steam traps. Tables are included of the flow of steam and water in pipes, also a standard specification. It is claimed that by the use of this catalogue an engineer can decide the sizes of pipes which will be required for certain duties, and can work out their cost, including the usual accessories.

Messrs. Aldous & Campbell, Ltd., Lower Bland Street, London, S.E.—Blotter card, showing one of their switch control electric passenger lifts.

Messrs. Mitchells, Ashworth, Stansfield & Co., Ltd., 23 and 24, Old Bailey, London, E.C.—24-page illustrated catalogue concerning "Mascolite," a material for reducing and correcting shocks and vibration and for deadening sound. Mascolite "P" (single thickness), is a special mixture of fibres which is used for permanent-way chair pads, and is used by tramway companies for lining the car underframes, &c.; "B U" (built up) is of the same material but with prepared cork between each layer, and it is used as packing for permanent-way chairs, engine foundations, &c.; a third-class is the "I.R." (with rubber insertions). The purposes of the material in connection with electrical machinery are well illustrated, and many testimonials are given.

Messrs. Petters, Ltd., 63, Queen Victoria Street, London, E.C.—Two finely prepared catalogues; one describes and gives a specification and tests of the firm's patent semi-Diesel crude oil engines, with a table of sizes and prices; the other deals equally well with their stationary and portable oil engines, combined engines and pumps, and electric lighting plants. Shipping weights and dimensions, prices, and a long list of users, are given. Both publications are beautifully illustrated.

Bankruptcy Proceedings.—Samuel Brookes (trading as Netherton Tube Fittings Co.), Chapel Street, Netherton, and Star Tube Works, Primrose Hill, Netherton.—Receiving order made February 19th on debtor's petition. First meeting, March 6th; public examination, March 18th; both at Dudley.

C. O. McMillan, electrician and cycle dealer, 15, High Street, Portmadoc.—Trustee (Mr. L. H. Jones, Chester) released November 4th, 1912.

Charles Spencer Northcote, electrical engineer, 67, Stanthorpe Road, Streatham, London. The following are creditors:—

Benton, C., London	£200	Eaton, T., Wimbledon	£20
Bourne & Hollingsworth, Ldn.	24	"Bankers" (London City and Midland Bank), London	600
Chalk & Cox, London	40	Osborn & Osborn, London	50
"Bankers" (Capital and Counties), London	110	Robinson, Peter, London	31
Debenham & Storr, London	548		

Clifton Robinson, Keith House, Porchester Gate, W.—Before Mr. Registrar Linklater, on Tuesday, an application on behalf of bankrupt for the variation of an order of 1911 suspending his discharge for four years, was heard. It appeared that debtor had been unable to obtain an appointment since he applied for his discharge, and he had been supported by his mother, Lady Robinson. The trustees of certain family funds had now considered the position, and had decided to provide £2,500 for the creditors if the Court would vary the order and grant the discharge straightaway. This would enable an additional dividend of 3s. 6d. in the £ to be paid to creditors. A claim by the father's executors for £18,000 would be released. It was stated that creditors for £12,000 approved of the application, though two small creditors thought the offer should be increased to 7s. 6d. The Registrar granted the application, and made the order of discharge, subject to judgment of £2,500.

J. W. Lewsley, electrician, Nottingham.—First meeting, March 6th; public examination, March 14th; both at Nottingham.

Ebonite Manufactures.—At the factory of the New Eccles Rubber Works, Ltd., at Eccles, a new shop, with special plant, has been devoted to the production of ebonite pipes, &c., required for the conveyance and storage of acid and other corrosive liquids. Lead and other materials previously used have been largely superseded, as ebonite is found to withstand successfully the action of even the strongest acids, and pipes made of this material are capable of standing enormous pressure. We are informed that in a test for a required strength of 30 lb. per sq. in., it was found that a pressure of nearly 80 lb. was resisted. At the works mentioned, pipes of all sizes are turned out, the more usual being from 2 in. to 6 in. bore. Stop cocks, bib cocks, valves, pumps, and all accessories are also made of ebonite. The company manufactures ebonite-covered rollers for textile purposes.

Clyde Tape.—We have received from Messrs. W. T. Henley's Telegraph Works Co., Ltd., a piece of cable insulated with vulcanised bitumen, on which a joint has been made and insulated with "Clyde" tape. We recently drew attention to the fact that this tape, when warmed with a blow lamp after the joint had been lapped with it, became one with the insulation on

the cable, and the specimen joint before us fully bears this out, for on slitting it open it is difficult to tell where the tape ends, and the original coating of bitumen begins. Such a joint should be found perfectly waterproof and of high insulation resistance.

Trade Announcements. — Mr. John Hargrove, late of Messrs. H. Simon, Ltd., of Manchester, has taken over the management of the London office of the Rees Roturbo Manufacturing Co., Ltd, manufacturers of rotary pumps and condensers.

The British Central Electrical Co. announce that, owing to increased business, they are moving to larger premises, and from March 1st their new address will be 6 and 8, Rosebery Avenue, E.C. (near Holborn Town Hall). Telephone number: "Holborn, 5848" (two lines); telegraphic address: "Briticent, Holborn, London."

LIGHTING and POWER NOTES.

Argentina.—It is expected that the electric light station at Merlo (Buenos Ayres), will be completed and ready for service in about three months' time. Public lighting will consist of 50 arc lamps.

It is reported that the Cia. Orlando Americana, which has the contract for the public lighting of Campana, intends to suspend the service as the Municipality is owing it $5,000, and it sees no prospect in getting the money.—*Review of the River Plate.*

Atherton.—The U.D.C. has adopted the recommendations of Mr. Miller for improving the system of electricity supply in the district, and instructed him to prepare the necessary plans and estimates for carrying out the scheme and report further. Inquiries are to be made for a suitable site for the proposed new substation.

Australia.—The Sydney (N.S.W.) City Council supply to Merrickville, recently inaugurated, will include shortly, in addition to street and private lighting, a supply of about 3,000 H.P. for power purposes, to the Sydney Steel Co. and others.

With reference to the proposed North Sydney Municipal Council supply from a private concern, efforts are being made to induce the Lord Mayor of Sydney to use his influence with the North Sydney authorities to take a bulk supply on new terms from the Sydney Council, and thus maintain the municipal service.

Barnes (Surrey).—The U.D.C. has decided to supply current to the hospital on a flat rate of 2¼d. per KW.-hour, or 3½d. per KW.-hour, subject to the usual discounts, for 2,000 KW.-hours during the winter quarters, and 750 KW.-hours during the summer quarters, and 1¼d. per KW.-hour beyond.

Bath.—The Electric Lighting Committee of the T.C. has decided to apply to the L.G.B. for an additional loan of £5,000 for mains and services for three years.

Bedford.—The T.C. has decided to proceed with the lighting by electricity of the streets in the Queen's Park district, at a cost of £1,151.

Chester.—Mr. S. E. Britton, the city electrical engineer, has effected a much-needed improvement in the lighting of Foregate Street, and incidentally conferred a boon on users of the thoroughfare. The old system of lighting was by arc lamps in series, which necessitated a number of standards down the centre of this important street. These poles have now been removed, and the lamps are suspended on the "Barrow" system, while the overhead tramway wires are supported from the premises or from standards erected inconspicuously near to the buildings.

Colne.—A firm of manufacturers erecting a new shed is in negotiation with the local Electricity Committee regarding the driving of looms by electricity. Provided satisfactory arrangements can be made, a trial will be given to a motor on each loom. This will open out a new development where hitherto this kind of loom-driving has been unknown.

Continental Notes.—France.—Representatives of 40 communes in the region between Ay and Epernay, in the Marne Department, have formed themselves into an intercommunal conference, with a view to the installation of an electric light and power service. A committee, consisting of nine mayors, has been nominated to draft the plans of the proposed installation.—*La Lumière Electrique.*

Belgium.—La Société de l'Electricité de l'Escaut has secured a 10 years' concession for the supply of the electrical energy required in connection with the new docks in the north district of Antwerp.

Darwen.—The Mayor started the new steam turbine at the electricity works on February 19th. The turbine has been installed at a cost of nearly £6,000. The Mayor congratulated the Electricity Committee upon the progress of the electricity department. At present there were half a dozen industries in the town relying upon electricity, and whereas they consumed 130,000 units a few years ago, they now consumed one million units. Councillor Thornley said there was a small loss on the electricity undertaking in 1911, but in 1912 the working showed a profit of more than £400.

Dover.—The electrical engineer has been instructed to report upon the desirability and cost of providing automatic time switches for the public incandescent lamps.

Ealing.—The chairman of the B.C. Electricity Committee has made inquiries into the proposals of the Fixed Price Light Co., relative to the B.C. entering into a contract with it for the fitting, wiring and lighting of small houses, under the scheme, now in force at Wimbledon and other places in or near London; and, in company with Alderman Green and the borough electrical engineer, he has visited Wimbledon, and inspected a number of the houses there to which current is supplied under the company's scheme. Before coming to any decision on the subject, the Electricity Committee has requested the engineer to procure certain additional information and submit it at the next meeting.

Edinburgh.—The Corporation Electricity Committee has agreed to recommend that the minimum charge for light should be 10s. per annum, and for power £1. It was also agreed that, should the minimum in either case for lighting or power not be used, to allow of a combined charge of 30s. per annum for lighting and power.

Finchley.—Application is to be made to the Local Government Board for sanction to a loan of £15,000, made up as follows:—Mains, £7,500; consumers' connections, £6,000; and meters, £1,500.

Fleetwood.—The chairman of the Electricity Committee and the electrical engineer have been deputed to inspect plant made by the three firms which have tendered for machinery, boilers, &c., required in connection with the extensions to the electricity works.

Galashiels.—It is stated the majority of the T.C. favour the idea of a municipal electricity scheme. A suggested site for the power station is on the town's property at the refuse destructor, and a siding from the railway could be conveniently laid. The probable capital cost of the scheme has been put at £30,000. The power is wanted chiefly for the mills. A deputation from the T.C. visited Glasgow to consult experts and obtain information to report to the Council. The question may be submitted to the decision of the ratepayers by plebiscite.

Ham.—The Highways Committee of the District Council reports the receipt of an application from the Twickenham and Teddington Electric Supply Co., asking for permission to place overhead wires across Ham Fields. It was agreed that the required consent be given on the company entering into an agreement to alter the position of the overhead lines, or place them underground if and when required by the Council.

Harrogate.—The T.C. has applied to the L.G.B. for a loan of £6,250 for the provision of additional plant for the electricity works.

The Council has decided to loan, free of charge, to consumers for a month's trial, electric irons for domestic use.

Hornsey.—At the February meeting of the B.C., it was decided to invite tenders for a new cooling tower. It was reported that delay in erecting the barometric condensing installation had resulted in the contracting company paying £65 as liquidated damages. A recommendation that application should be made to the L.G.B. for sanction to the borrowing of a further sum of £3,000 for house services was referred back.

The North Metropolitan Electric Power Distribution Co. wrote referring to the Bill promoted by the Tottenham and Edmonton Gas Light and Coke Co., Ltd., and suggesting that the Council should oppose the Bill, and that evidence from representatives of the Council might be forthcoming in the first instance at the ensuing Board of Trade inquiry, in favour of the company which was applying for a Wood Green electric lighting prov. order. It was decided not to adopt the suggestion. A petition is to be presented against the Bill promoted by the Metropolitan Electric Tramways, Ltd., authorising them to provide and work trolley vehicles on certain routes in Wood Green, Tottenham, and Walthamstow, with a view to linking up districts served by existing tramways. It is considered that local authorities should be consulted when power for construction is sought.

Huddersfield.—The financial statement relating to the electricity undertaking for the year ending December 31st last showed that the income had been £45,078, compared with £39,592 for the previous year, the chief items being single-phase lighting, £24,962; single-phase power, £4,614; and three-phase power, £11,123. The expenditure amounted to £28,511, against £23,978 for 1911, leaving a surplus balance of £16,566. Interest on loans absorbed £6,960, redemption of debt £5,352, and the amount repaid to the Public Works Loans Board was £1,653. The sum of £600 was transferred to the depreciation and contingencies account, which now stands at £5,818, and the balance of £2,000 was carried forward.

India.—The Nagpur Electric Lighting Co. has been started to provide the chief city of the Central Provinces with electric light and power. Work has already been commenced, and it is expected to have some of the engines and dynamos running by next hot season. An arrangement has been come to with the local Government, whereby a minimum load is guaranteed; current is required for 14 miles of street lighting, private bungalows, and railways and lighting. In time to come, the local cotton mills might be induced to buy power in bulk from the company. The machinery is to be provided by Messrs. Crompton and Co.—*Indian Textile Journal.*

London.—Last week the South London Electric Supply Corporation, Ltd., held a five days' electric heating and cooking exhibition at Raleigh Hall, Brixton, S.W. A representative selection of apparatus for domestic purposes was shown, including breakfast cookers, toasters, kettles, flat irons, radiators, convectors, &c., many of which bore labels stating the cost of running per hour. A "Belenus" water heater, several portable vacuum cleaners, and choice lighting fittings were also in evidence. The *pièce de resistance* of the exhibition was the "Eclipse" cooker, comprising large oven, grill and two boiling rings. This apparatus was most ably demonstrated to full assemblies twice daily by Mr. Miller, of the Electric and Ordnance Accessories Co. Visitors who wished to put Mr. Miller's statements to a practical test were enabled to do so in the electric café, which adjoined the main hall. We note that the South London Co. has now introduced the "assessment" system; the fixed charge per annum is 12½ per cent. on the net assessment, payable in four equal quarterly payments, and ¾d. per unit is charged for all current consumed. Or alternatively, and for the convenience of those consumers preferring to be charged through a separate meter for current used for heating and cooking purposes, the following flat rates have been introduced: for apparatus installed up to 1 KW. capacity, 2d. per unit; over 1 KW. to 2·5 KW., 1½d. per unit; over 2·5 KW., 1d. per unit. All apparatus is supplied on the hire-purchase system, and is installed by the Corporation's own contracting department. We understand that up to Friday last, the "Sales Department" had received a great number of inquiries from prospective consumers, and it is expected that good business will result. The Corporation has our best wishes in this connection.

MARYLEBONE.—The Electric Supply Committee states that Mr. J. F. C. Snell has now presented his full report upon the question of extensions of plant necessary to enable the Council to meet next winter's supply. In this report Mr. Snell urges the necessity of the plant being installed at once. There are, he continues, five possible methods of dealing with the problem:—(1) Continuous-current extension on similar lines to the existing plant; (2) Three-phase alternating-current plant at the power station, and high-tension transmission cables to converters (to continuous current) fixed at the sub-stations; (3) Diesel engine generators at the sub-stations; (4) Battery extensions at the sub-stations; and (5) bulk supply, *i.e.*, the purchasing of current in bulk from some outside source, and of these he recommends the second. With regard to the converting plant, the scheme recommended provides that 1,000-KW. machines should be used and standardised; and that four such machines be installed at present, namely, one at the station, two at Manchester Square sub-station, and one at Rathbone Place sub-station. So far as the transmission system is concerned, it is proposed to use three ·15 sq. in. three-core E.H.T. cables from the station to Manchester Square sub-station, and two similar cables from Manchester Square to Rathbone Place sub-station. As to the condensing plant, British-made condensers are recommended, one to be worked in conjunction with the canal water and one with the cooling towers. The present equipment of boilers is ample for some time to come, so far as steam-raising plant is concerned. The cost of this scheme, based upon one turbo-alternator and on actual tenders, is put at £32,612. The losses in transmission and conversion would not exceed 10 per cent., and the available amount for distribution would be 2,700 KW. (normal) and 3,375 KW. (overload). The annual capital charges would be £3,195, or £1·17 per KW. (normal rating), and the running cost per unit available for distribution, including wages for extra staff, ·168d. With the addition of the second alternator the capital outlay is raised to, say, £42,000, to allow for contingencies, the corresponding annual capital charges being £4,195, or £1·25 per KW., taking the maximum output of one set only, and counting the other wholly as reserve. Mr. Snell does not advise the entire change of system of generation and supply to alternating current which would involve considerable alterations both at the works and on the mains, and recommends that the present plant be unaltered, and used only for peak load purposes and as a reserve to the three-phase plant during lighter loads. After considering this report the Committee recommends the adoption of the scheme, and that application be made to the L.C.C. for sanction to a loan of £42,500, and that contracts be entered into with the Oerlikon Co. for the supply, in addition to the turbo-alternators authorised, of condensing plant to be manufactured by the Worthington Pump Co., at a cost of £8,964, making, with the £8,600 already authorised, a total of £17,564; Messrs. Ferranti, Ltd., for the supply of switchgear, &c., at a cost of £2,384; the Oerlikon Co. for the supply of condenser motors and control switchgear, at a cost of £1,709; British Westinghouse Electric and Manufacturing Co., Ltd., for the supply of four 1,000-KW. converters, &c., at a cost of £8,908.

At the meeting of the Council last week these recommendations were opposed on the ground that, as the matter had only been in the hands of the Committee about 24 hours, there was not time enough for the matter to be mastered. Alderman Debenham, supporting the Committee's recommendations, said that it was very necessary to have the new plant, as the business was increasing much more rapidly than was supposed. The saving in coal alone would practically pay all the capital charges.

Councillor Maude asked for more information about the £42,500, and about the actual liabilities of the undertaking. It was over two millions in debt, though they had been paying off for seven years, and now there was this fresh loan. It was a very serious matter for Marylebone to consider. Councillor Warren protested against the Committee going to Switzerland for plant. Councillor Garrould said it was impossible to give the order to a British firm. The machinery could only be obtained from one particular firm. Councillor O'Brien thought the need for the new plant had been shown very clearly. In 1907 they only sold seven million units, but last year they sold 13 million, and in 1916 they would be selling 16 millions or more. In the result the recommendations were carried.

LEWISHAM.—At a meeting of the B. of G. on Monday, the General Purposes Committee reported it had considered the question of lighting the workhouse by electricity, and recommended the board to take the necessary steps for the installation of the electric light throughout the workhouse and offices. The board has already decided to install the electric light in the infirmary. A letter was read from the L.G.B. stating that it would be prepared to consider favourably the granting of a loan for a definite scheme for the electric lighting of the infirmary and workhouse. Letters had also been received from the South Metropolitan Gas Co. submitting a scheme for providing and erecting a gas-driven electricity generating plant, and instructions were given for application to be made to the company for a list of authorities, &c., where such a scheme was in force. The board decided to install the electric light in the workhouse, and to call in an expert for advice.

The L.C.C. on February 20th, 1912, appointed a special committee to consider and report on the whole question of electricity supply in London and to confer with Government Departments and local authorities and companies generating or supplying electricity in London.

Sixteen meetings have been held and a preliminary survey of the question has been made, but no conclusions have yet been arrived at, and the committee makes no detailed report at this stage. It is suggested that a committee should again be constituted to complete the inquiry.

ST. PANCRAS.—The Electricity Committee, reports with reference to the tender of the Brush Co., which was accepted by the Council for the supply of a 5,000-KW. Ljungstrom turbine, that the company has asked that the penalty of £40 per week, for any delay that may occur in the supply of the turbine, should be deleted, inasmuch as the 1,000-KW. Ljungstrom turbine, which in the meantime is to be supplied on loan, may be retained for use by the Council without extra charge in the event of the delivery of the 5,000-KW. machine being delayed. It has been decided to comply with this request. Application is to be made to the L.C.C. for sanction to borrow £15,000 in connection with the turbine in question.

SOUTHWARK.—The Electric Light Committee of the B.C. has had under consideration a report from the electrical engineer embracing a scheme of extension in connection with the undertaking, which is required to be carried out at a very early period. Having regard to the importance of the subject, and the expenditure involved, it has beendecided to engage expert advice at a cost not exceeding 150 guineas.

The North Metropolitan Electrical Power Co., at its Winchmore Hill sub-station on Wednesday, last week, held a very instructive gathering to fittingly inaugurate the new system of electric lighting in Green Lanes, Southgate. Many Councillors and officials from neighbouring authorities were present, the idea being to exhibit what could be done. Mr. Devonshire, the managing director of the company, presided in an informal sort of way, and referred to the high ideals which the electrical experts had set before themselves. Mr. Ruthven Murray, the company's engineer, gave a short address upon the scheme, the technical details of which aroused much interest. After votes of thanks had been passed, the party boarded a special tramcar and were taken for several miles along the main road to see the new lighting, which is on the "Barrow" system.

Loughborough.—At a meeting of the T.C. in committee on Monday last week, a report was presented from the Gas and Electricity Committee, in which it was stated that owing to the embarrassing position arising from the many changes made from time to time by the Brush Electrical Engineering Co., and the delays in negotiations for giving it a bulk supply of electricity, the Committee felt bound to report that several questions of vital importance still remained unsettled, one being as to the time required by the company for the delivery of the plant to be supplied by it. The company now intimated that it declined to be bound to give delivery in less than nine months, which the Committee regarded as a prohibitive period, having regard to the general demand on the undertaking for next winter. The Committee, therefore, recommended that the negotiations with the company be postponed for the present, and that the Corporation proceed without delay to make extensions of the plant, to be available for the ordinary supply next winter. The approximate cost was estimated at £10,000. The report was adopted.

Pendlebury.—Messrs. Andrew Knowles & Sons., Ltd., are about to introduce electric power for haulage purposes in the Pendlebury and Clifton Hall mines. The announcement was made at the shareholders' meeting last week. Current will be delivered from the Lancashire Power Co.'s mains to a sub-station, where it will be reduced to a suitably low voltage. The electric haulages will supersede the compressed air engines which have hitherto been used for haulage purposes. The installation will probably be commenced about Easter.

Peterborough.—In the course of a report to the Council, presented on Tuesday, the electrical engineer, Mr. J. C. Gill, drew attention to the probably overloaded condition of the station plant next winter, and urged the necessity of purchasing additional plant. He proposes that two extra boilers (£1,230) and a 500-KW. turbo-generator (£3,400) should be installed. The Electric Lighting Committee has approved the engineer's report, and recommends the borrowing of £7,000 for carrying out the scheme, which would complete the equipment of the existing station.

Plymouth.—The Electricity Committee has approved of a resolution that the Embankment Road should be lit by electricity.

Rawtenstall.—The borough electrical engineer and the borough surveyor have been requested to consider and report upon the proposed lighting by electricity of the workmen's dwellings to be erected on Carr Farm estate.

St. Mary Cray (Kent).—A large new power house is being erected at St. Mary Cray Paper Mill, by Messrs. Joynson and Son.

Siberia.—According to the *Board of Trade Journal*, a complete project for equipping the port of Vladivostok with cranes, elevators, repair shops, refrigerating and electrical plant has been drawn up, and some £15,000 has been allotted for the building of an electric power station.

Silsden.—The application of the Airdale Shed Co. for permission to lay an electric cable to serve the proposed new shed has been withdrawn.

Skipton.—To celebrate the completion of a rearrangement of premises and installation of electrical driving and lighting, the directors of Messrs. John Dewhirst & Sons, Ltd., dyers and spinners, of Skipton, have invited the whole of their employés, numbering about a 1,000, to a series of entertainments and socials on March 7th. The work of addition and reconstruction has occupied about four years. The whole of the machinery is driven by a newly-installed Westinghouse 1,250-KW. turbine and generator. The 40 motors in the works are of British Thomson-Houston make.

Southport.—The General Purposes Committee of the T.C. on February 24th passed a recommendation to the Council that the management of the tramways and the electricity undertakings should be separated, and not a joint affair as at present.

Swanage.—The Dorset Electricity Supply Co., which has been promoted by Dr. Purves, of Exeter, in order to provide an electricity supply for the town, has approached the U.D.C. on the question of public lighting. The company offers to light 60-C.P. lamps until 11 p.m. at a charge of £2 10s. 6d. per annum, 100-C.P. lamps at £2 17s. 6d., 200-C.P. lamps at £4 10s., with a minimum yearly payment of £150.

Swinton.—The L.G.B. has given sanction to the Swinton and Pendlebury District Council for the borrowing of £600 for laying cables for the supply of electricity to Broad Oak Park.

Walkden.—A number of looms which have been put down in the Boatshed Mill, Walkden, by Messrs. E. Lane & Sons, of the Hope Mills, are to be electrically driven.

Wednesbury.—The profits of the Corporation's electricity undertaking amounted last year to only £23. In consequence of this, it is stated that the charges to consumers are to be raised, and that an increase of 15 per cent. may be anticipated.

West Ham.—The electrical engineer suggests that, owing to the continued increase in connection with the supply of current, arrangements be made with Messrs. Babcock & Wilcox to extend their present contract for two boilers to three. The amount which it will be necessary for the Council to raise for this purpose is £7,363, of which £4,785 represents the amount of the quotation for boiler and accessories to complete the pair already in hand. The electrical engineer's suggestions have been agreed to.

Willesden.—In connection with the Council's decision to erect a sub-station in Barret's Green Road, application is to be made to the L.G.B. for sanction to borrow £3,318, of which amount £2,545 will go towards the cost of the new plant required.

Worsley.—The Lancashire Power Co. will shortly open a new sub-station at the Crescent, Worsley, established in connection with a big lighting scheme for Worsley district.

TRAMWAY and RAILWAY NOTES.

Canada.—A company has just been formed at Walkerville, Ont., under the name of the Tate Electric Co., to establish works for the construction of electric motor-cars for the Canadian market.

Continental Notes.—SWITZERLAND.—The Commission d'Etudes charged by the Federal Railway Administration to study the electrification of the St. Gothard Railway, has submitted its last report. It advises the adoption of single-phase traction at 15 periods and 15,000 volts. To obtain the power required, it is proposed to construct a station on Lake Ritom in the south and stations at Goschenen and Amsteg in the north, which will furnish an aggregate of 96,000 H.P. The installations to be carried out include works for the production and distribution of energy (29,000,000 fr.); supply and distribution mains (9,770,000 fr.); rolling stock, depôts and repair shops (21,900,000 fr.); conversion of power-stations (3,500,000 fr.). The Commission has again considered what power will be necessary to supply the whole of the Swiss railways, on the assumption of double the traffic of the year 1904. The five Federal networks and the private lines will need yearly from 1,000 to 1,300 million H.P.-hours at the turbines. The generating stations should, therefore, be built for a total output of 500,000 H.P. According to expert calculations, there exist a dozen falls still unappropriated or reserved for the use of the Federal railways, which, in combination, could supply 1,800 million H.P.-hours per year at the turbines; the generating stations might therefore be built for a maximum capacity of 625,000 H.P.

FRANCE.—The Conseil Général has voted a sum of 30,000,000 fr. for the construction of the third network of local railways in the Departement of the Pas-de-Calais, of an aggregate extent of 611 km, divided into four groups, two of electric lines and two of steam.—*La Lumière Electrique.*

RUSSIA.—The "Telephon" Co., of Moscow, has secured a concession for a proposed electric railway between Vaulograd and Bachmut

ITALY.—The plans for an electric railway between Aosto and Pré-St. Didier having been approved by the local authorities concerned, application for a concession to the Consiglio Superiore dei Lavori Pubblici is being made. The line will prove a benefit to the forestry industry, and supply transport facilities to the collieries of Cogne and La Thuile.—*Giornale dei Lavori Pubblici.*

GERMANY.—A concession has been granted in respect of a projected light electric railway between Niederursel and Konigstein, near Frankfort-am-Main.

East Ham.—The electrical engineer and manager has been instructed to report upon the question of duplicating the tramway track in High Street North.

Edinburgh.—A report by the burgh engineer on the subject of the double-decked tramway cars in the city, and suggesting that a request might be made to the tramway company to increase the number, was before a meeting of the Tramway Committee, and it was agreed to communicate with the company.

Hong-Kong.—Recently the Chinese community have systematically boycotted the tramways, the reason given being the decision of the company to accept only Hong-Kong money. As it was found that the real reason was a political one, the Government passed a special Ordinance imposing penalties for improper interference with business. It is stated that these measures have already had a salutary effect on the Chinese community.

Huddersfield.—The Tramways Committee has decided to double the tramway from Salendine Nook to Mount.

Leeds.—It is anticipated that the extension of the Corporation tramways from West Park to Lawnswood will be completed within a few weeks. The track has been laid over the greater part of the route, and it is probable that the extension will be ready for opening by Easter.

The tramways authorities have decided to try, as an experiment, the system of fare collecting on the platforms of the cars. For a long time this system has been actually in practice in an irregular manner, the observance of the rule against it having been very much relaxed.

London.—The L.C.C. tramways department has decided to enlarge the capacity of the Camberwell, New Cross, Stockwell, Tooting, Camden Town and Clapham sub-stations, by substituting three large rotary converters for six small motor-generators at present in use at the Shoreditch sub-station, and transferring the small machines to the other stations. The cost of the converters, transformers, switches, crane, &c., is estimated at £14,000, and the work of transferring the plant, &c., at £4,000.

The Council has introduced an innovation in the form of numbered cars for denoting the different services; the system has been divided into nearly 90 services.

As a result of the strong protests, the scheme for a tramway subway along the east of St. Paul's Cathedral has been withdrawn, necessitating the abandonment of the proposed tramway across the suggested new St. Paul's Bridge.

With reference to the L.C.C. (Tramways, Trolley-Vehicles and Improvements) Bill, the Kensington, Hammersmith and Westminster Councils have decided to call the attention of their Parliamentary representatives to the matter, and ask them to resist any proposal for the equipment of any overhead system of traction which dispenses with the necessity of the County Council first obtaining the approval and consent of the local highway authority concerned. Southwark, Wandsworth, Hammersmith and Kensington Councils have decided to express their objection, in a similar manner, against the Metropolitan Electric Tramways (Railless Traction) Bill, Clause 16 of which apparently authorises the Board of Trade to grant provisional orders to the company to run railless cars on any routes which it thinks convenient, a power which might be exercised over the head of any local authority, if, in the opinion of the Board, such consent was unreasonably withheld

Speaking at the meeting of the North London Railway Co., Lord Rathmore said that the passenger traffic receipts were the worst they had ever experienced, and were the result of the competition of the tube railways and motor-buses, a competition which seemed to grow stronger and more destructive every day. He was afraid that they must make up their minds that they would not have any effective means of fighting that competition until their line had been electrified, in conjunction with the London and North-Western Railway to Watford. He thought they might reasonably hope that when that had been done they would receive constantly increasing receipts from passenger traffic coming over their line, and especially from the Willesden and Watford districts.

Mexborough.—The U.D.C. has petitioned against the preamble of the Mexborough and Swinton Tramways (Railless Traction) Bill. The petition calls attention to the statutory limitations of the company concerned in the scheme, with respect to capital powers, and the Council maintains that it is better able to carry out such a scheme if it is necessary, having already an up-to-date electrical station, &c., and being at present supplying current for lighting purposes at 3½d. per unit, which is cheaper than in any other place in Yorkshire.

Midland Railway Electrification.—At this company's half-yearly meeting, the chairman, referring to the question of electric traction, said the company would have to go to Parliament next year for powers to electrify the Tilbury line.

Newcastle-on-Tyne.—At a meeting of the Tramways Committee, on February 21st, a deputation was received from the Gosforth U.D.C, urging that no extra fares should be charged for running cars to Gosforth and Gosforth Park, while the race meetings were being held and on other special occasions. Counsel's opinion had been taken, and it was said that the Committee had no power to increase the fares. The Committee decided to call a special meeting of the members in a fortnight's time to consider the matter. The ordinary fare to Gosforth is 2d., and to Gosforth Park 4d., but on the occasions to which attention is drawn, special cars are put on with an upstanding charge, usually of 1s. The contention of the Committee is that the Corporation would lose money if the fares were not increased on the occasions referred to. Extra cars, they claim, had to be brought into requisition, and the Tyneside Tramways and Tramroads Co. had to have a share of any balance left after paying expenses.

Plymouth.—The Tramways Committee has instructed the town clerk to interview the representatives of the Plymouth, Stonehouse and Devonport Tramways Co. with respect to its request for the reconstruction of the track in Union Street. It has also been resolved that books of 12 tickets of face value be issued on the tramways.

Southport.—On Saturday a poll of ratepayers was taken as to whether the Corporation should run cars on Sundays, and the result was:—For, 1,763; against, 2,242; majority against, 479. This is the second plebiscite on the matter, the previous one in 1903 resulting as follows:—For, 1,843; against, 3,639; majority against, 1,805. For some time there has been a loss on the running of the Corporation cars, and some of this is ascribed to the absence of a Sabbath service. Strong opposition to Sunday running was offered by the local Free Church Council and other religious bodies.

Stirling.—Another step forward has been taken in the movement to provide the town with an up-to-date system of electric tramways. For some time past, the T.C. has had the matter in hand, and the town clerk has been instructed to write to Mr. George Balfour, London, informing him that the Council is anxious to secure an electric tramway system, and inviting him to look into the matter with the view of such a tramway being undertaken by the parties whom he represents. It has also been agreed to make inquiries as to the railless system of traction, and with this in view the town clerk and burgh surveyor are to ascertain the experience of the towns where the system is in operation.

Tipton.—A letter has been received from the Birmingham and Midland Tramway Joint Committee intimating that it was of opinion that there would not be sufficient traffic between Great Bridge and Ocker Hill to justify the heavy expenditure of laying a tramway along this route, but if the Council had reason to believe otherwise, and would obtain the powers and build the tramway, the company would be prepared to provide the necessary rolling stock, and run a service of cars on terms to be agreed. The matter has been referred to the Tramways Committee for consideration.

TELEGRAPH and TELEPHONE NOTES.

Imperial Wireless System.—The Postmaster-General has informed the Marconi Co. that he does not share the company's view that it is entitled to retire from the contract for the Imperial wireless chain, and will hold himself free to enforce all his rights against the company.

A report of the Select Committee to the House of Commons was published on Tuesday, embodying resolutions which the Committee agreed to report to the House. The resolutions are to the effect that the Committee proposes to retain the conduct of the inquiry entirely in its own hands, but asks leave to hear counsel when necessary; and that the Committee invites any person in possession of evidence bearing upon the negotiation and completion of the agreement to communicate with the clerk.

Liverpool.—The Mersey Docks and Harbour Board has adopted a recommendation of the Marine Committee that the Board should enter into an arrangement with the B. of T. and the Post Office for the establishment of several wireless stations, on lightships and at the dock office, for the benefit of navigation at the mouth of the Mersey.

Long-Distance Telephony.—The trans-Continental telephone circuit between New York and San Francisco, to be built by the American Telephone and Telegraph Co., will be equipped throughout with Pupin coils, two coils per 8 miles. The copper wire will weigh 940 lb. per mile of route, and as the distance is 3,500 miles, the total weight will be 3,290,000 lb. There is a difference of three hours in time between New York and San Francisco, so that the business day will be limited to about five hours.—*Telegraph and Telephone Age.*

New Zealand.—The Government will shortly put into operation in New Zealand regulations making it compulsory for passenger ships to carry wireless apparatus.

The Government has decided to adopt the full automatic telephone system for centres requiring new equipment, and has been calling for tenders for full equipments for Auckland, Wellington, Hamilton, Masterton, Blenheim and Oamaru. The original intention was that switchboards carrying 10,000 lines each should be installed in each of the four cities, and smaller systems in the provincial towns. Ultimately the Auckland and Wellington exchanges will be enlarged to a capacity of 15,000 lines. It is estimated that the new system will be completely installed in the two largest cities by the end of 1913. Meanwhile the pressure on the existing manual systems in Auckland and Wellington is to be relieved by the installation of small switchboards carrying 400 or 500 lines, which will be adapted for use with the present switchboards.—*Australian Mining Standard.*

Suffragist Outrages.—On Saturday morning a large number of telegraph wires in Chester Moor Dene, a mile south of Chester-le-Street, near Newcastle, were cut, and during the week-end the wires in four public telephone boxes in Birmingham were cut, and the instruments rendered useless. Similar outrages are reported from Belfast.

Trans-Atlantic Communication.—Tests made with a temporary antenna 400 ft. high, at the new Telefunken tower at Nauen, in Germany, on January 11th, showed that there was no difficulty in communicating with the station at Sayville, U.S.A., and messages transmitted from the latter station with 45 H.P. were clearly received at Nauen.

Mr. H. Bredow, managing director of the Telefunken Co., is in New York with a view to establishing a wireless service between Europe and the U.S.A.—*Telegraph and Telephone Age.*

CONTRACTS OPEN and CLOSED.

OPEN.

Aberdare.—March 3rd. Service materials, for the U.D.C. electricity department. See "Official Notices" February 14th.

Aberaman.—March 10th. Electrical goods, for the directors of the Powell Duffryn Steam Coal Co., Ltd. Stores Manager, Aberaman, near Aberdare.

Argentina.—April 15th. Tenders will be received at the Dirección General de Minas, Geología e Hidrología, Buenos Ayres, for the supply of motors, cables, dynamos and kindred material required for the generation of motive power.—*Board of Trade Journal.*

April 15th.—The Ministry of Agriculture of the Argentine Republic in Buenos Ayres is inviting tenders for plant, including three-phase alternators and motors, switchboard, mains, &c., for a new electricity generating station.

Australia.—April 14th. H.M. Trade Commissioner for Australia reports that tenders are invited for plant required to generate three-phase current for the high-power radio-telegraph station at Darwin, Northern Territory, and for lighting and power purposes in the neighbourhood:—Four Diesel oil engines, two to drive a 500-KW. alternator each, and two to drive a 250-KW. alternator each; an air-compressor set; an overhead travelling crane of 20 tons capacity; four alternators and exciters, two of 500 KW. capacity and two of 250 KW. capacity; and a switchboard. The earliest date of delivery must be stated. Tenders to the Secretary, Postmaster General's Department, Melbourne. Deposit 5 per cent. on the first £1,000, and 2½ per cent. on the amount above that sum. Specification and form of tender obtainable from the Australian High Commissioner in London, 72, Victoria Street, S.W., where also preliminary deposits may be paid. Specification and form of tender may be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.—*Board of Trade Journal.* The matter is referred to in our "Official Notices" to-day.

Ayr.—The Town Council invites tenders for advertising on the tramcars for five years. Mr. P. A. Thomson, Town Clerk.

Barrow-in-Furness.—March 3rd. Electrical stores for a year, for the T.C. Borough Electrical Engineer.

Bedwas.—March 5th. Electrical goods for a year, for the Bedwas Navigation Colliery Co., Ltd. (Form 4). The Secretary.

Belfast.—March 12th. The Harbour Commissioners are inviting tenders for four 5-ton electric gantry cranes for the Queen's Quay and Abercorn Basin Quay. Specifications, &c., from the Harbour engineer, Mr. W. Redfern Kelly, Belfast.

Birmingham.—March 1st. Electrical stores for a year, for the Birmingham, Tame and Rea District Drainage Board. Mr. John D. Watson, engineer, Tyburn.

Bosnia.—LIVNOI.—March 20th. Tenders are required for the erection of a power station and public and private electric light installations, according to a special programme. Particulars of the Municipal Administration, Livnoi, Bosnia.

Bridgend.—March 21st. One 400-K.V.A. steam alternator and accessories, for the U.D.C. See "Official Notices" to-day.

Brighton.—March 10th. Storage battery (800 amp.-hours) for the T.C. See "Official Notices" to-day.

Colchester.—March 10th. Sundry stores for the Corporation Electricity Department. Mr. W. Frisby, electrical engineer, Osborne Street.

Croydon.—March 31st. Stores for a year, for the Corporation Electricity Department. See "Official Notices" Feb. 21st.

Dundee.—March 7th. Two water-tube boilers, mechanical stokers, economiser, steel bunkers and coal-handling plant, for the Corporation electricity department. See "Official Notices" February 21st.

Eastbourne.—March 10th. Combined coal elevator and conveyor for the Corporation Electricity Department. See "Official Notices" to-day.

Edinburgh.—The Corporation invites tenders for arc lamp globes, cast-iron pavement boxes, underground conduits for electricity cables. Mr. F. A. Newington, engineer.

Egypt.—July 1st. Egyptian Government Public Works Ministry. Machinery and pumping plant for Baltim pumping station, including 15 Diesel or 12 steam engine plants and electric lighting and power plant, workshop equipment, cranes and weigh-bridge, boiler plant, fuel economisers, steel chimneys, coal and ash handling apparatus. Particulars (£1 per copy) at Office of Public Works Ministry, Cairo, or of Sir A. Webb, Queen Anne's Chambers, Westminster.

Erith.—March 6th. Electrical work for three years, under U.D.C. assisted wiring scheme. See "Official Notices" Feb. 21st.

France.—PARIS.—March 8th. Supply of copper wire covered with gutta-percha and cotton. March 11th.—Supply of extensible telephone switch tables. March 12th.—Supply of electric cables. Particulars of cahier des charges, &c., from Bureau des Postes et Télégraphes, 103, Rue de Grenelle, Paris.

March 6th.—Supply of electric cable for the service of the Postes et Télégraphes de l'Indo-Chine. Guarantees: provisional, 550 fr.; final, 1,100 fr. Particulars of the Ministère des Colonies, 57, Boulevard des Invalides, Paris.

DUNKERQUE.—March 15th. Tenders are required for the supply and erection of the mechanical and electrical appliances to work a 61-metre swing bridge to be erected in the Freyanet Docks at Dunkerque. Particulars of M. Bourgeois, ingénieur-en-chef, Dunkerque.

G.C.R.—March 4th. The Great Central Railway Co. are inviting tenders for stores during the year ending April 30th, 1914. For further particulars see this column last week.

Heston and Isleworth.—March 8th. Stores and materials for a year, for the U.D.C. electricity department. See "Official Notices" February 21st.

Hungary.—SZÖD.—Tenders will be received for a concession to establish an electric installation and supply public and private lighting and power current, for a period of 50 years, to Szöd and ten neighbouring districts. Guarantee deposit, 10,000 kronen. Particulars of the Gemeindeamt, Szöd.

Ilford.—March 1st. Council Education Committee. Tenders for the electric lighting installation at the South Park School extension, Water Lane, Ilford. Mr. C. J. Dawson, architect, 11, Cranbrook Road, Ilford.

March 1st.—Stores for a year, for the Tramways Department of the U.D.C. Mr. L. E. Harvey, manager, Ley Street depôt.

India.—March 14th. Motors, transformer and motor-generator, for the B.B. and C.I. Railway. See "Official Notices" February 21st.

March 4th.—Starting and controlling pillars, for the Bombay, Baroda and Central India Railway. See "Official Notices" February 21st.

King's Lynn.—March 1st. Lancashire boiler, economiser and pipework, for the Corporation Electricity Department. See "Official Notices" February 21st.

Liverpool.—OXTON.—Electric light installation at St. Saviour's Church, for the Vicar and Wardens.

March 10th.—Electrical fittings for a year, for the Select Vestry Mr. C. W. Coster, clerk, Brownlow Hill.

London.—L.C.C.—March 4th. Two 2,000-KW. turbo-generators, with condensing plant, &c. (extension of time). See "Official Notices" February 21st.

March 5th.—Electrical installation at the Curtain Road Elementary School. See "Official Notices" February 21st.

March 12th.—Electrical installation at Hawley Crescent School, St. Pancras. See "Official Notices" to-day.

It is also proposed to put in hand at an early date, the electric lighting of the following schools:—North Camberwell (Leipsic Road); Walworth (Victory Place); and Woolwich (Avery Hill Training College Hostels). Tenders are being advertised for, and a sub-committee is to be authorised to accept tenders during the recess.

The Fire Brigade Committee recommends that tenders be invited from selected firms for two electrically (one petrol-electric) driven motor fire escape vans and two motor turntable ladders.

Tenders are to be invited by the Highways Committee for the erection of the Leighton Road, Kentish Town, tramways permanent way depôt.

The Committee also recommends that three rotary converters, transformers and accessories, switchgear and cabling be substituted for other plant at present in use at Shoreditch tramway power station.

ST. PANCRAS.—March 4th. Arc lamp carbons, for the B.C. See "Official Notices" February 7th.

STEPNEY.—March 17th. Boilers and boiler house accessories, turbo-alternators, condensers, accessories and switchgear, for the B.C. See "Official Notices" February 14th.

BATTERSEA.—March 19th. One water-tube boiler, mechanical stoker, superheater and pipework, and one motor-driven centrifugal pump and pipework, for the B.C. See "Official Notices" to-day.

Macclesfield.—March 11th. Electrical goods for the Cheshire County Asylum, Parkside. Mr. Wm. Tingay, clerk of the Asylum.

Merthyr Tydfil.—March 3rd. Electrical accessories for a year, for the B.G. The Workhouse Master.

Morecambe.—March 19th. 2,500 tons of coal or slack for the Corporation Electricity Department. See "Official Notices" to-day.

Morocco.—March 27th. Tenders are invited for the supply of 15,000 insulators and brackets. Particulars from Monsieur le Président de la Commission générale des Adjudications et des Marchés, Dar-en-Niaba, Tangiers.

Neath.—March 3rd. One 400-KW. high-speed engine, direct-coupled to a two-phase alternator, and accessories, for the R.D.C. See "Official Notices" February 14th.

Newport (Mon.).—March 4th. Electric light fittings for the B. of G. Mr. A. H. Rees, Clerk, Queen's Hill.

Pontypridd.—March 5th. Stores and materials for the U.D.C. electric light and tramways department. See "Official Notices" February 21st.

March 17th.—Tramway men's uniforms for the U.D.C. See "Official Notices" to-day.

River Plate.—April 5th. The Municipality of La Paz (Entre Rios) is calling for tenders for the erection of an electric light station.—*Review of the River Plate.*

South Shields.—March 10th. Stores for a year for the Corporation Electricity Supply Department. Mr. H. S. Ellis, electrical engineer, Mill Dam.

Swindon.—March 8th. General stores and materials for a year, for the Corporation electricity and tramways departments. See "Official Notices" February 14th.

March 10th.—One 500-KW. mixed-pressure turbine and condensing plant, boiler feed pump and pipework, and one switchboard panel and cables, for the Corporation. See "Official Notices" February 14th.

Swinton and Pendlebury.—March 10th. One 25-KW. transformer and switchboard, main along Chatsworth Road, and annual supply of materials, for the U.D.C. Electricity Department. See "Official Notices" February 21st.

Uruguay.—March 29th. Five electric gantry cranes for Customs warehouses at Monte Video. B. of T. C.I. Department in London.

Wallasey.—March 15th. Fuel oil (400 tons) for a year, for the Corporation electricity department. Mr. J. A. Crowther, electrical engineer, Seaview Road, Liscard.

Walthamstow.—February 28th. Four double-deck tramcars complete with magnetic-brake equipments for the U.D.C See "Official Notices" February 7th.

War Office.—Cables, electrical stores, iron telegraph poles, &c. See "Official Notices" to-day.

Warrington.—March 5th. Motors and transformers for a year, for the Corporation. See "Official Notices" Feb. 14th.

Waterford.—The Asylum Committee has decided to invite tenders for the installation of an electric plant, in accordance with the estimate of Mr. Lawless, which amounted to £3,929.

Wimbledon.—March 5th. Stores and materials, for a year, for the Corporation Electricity Department. See "Official Notices" February 14th.

Wrexham.—March 1st. Stores for a year, for the Borough Electrical Engineer's department. See "Official Notices" February 14th.

York.—March 10th. One 3,000-KW. turbo-alternator, with condensing plant, pipework and switchboard, water-tube boilers with chain-grate stokers, &c., storage battery and H.T. cables, for the Corporation. See "Official Notices" February 21st.

CLOSED.

Barnsley.—The T.C. has accepted the tender of Mr. Jas. Taylor, of May Day Green, for telephone fittings for inter-block communication at the hospital, at £49.

Belgium.—Several Belgian and German concerns submitted tenders last week for the supply and laying of two lots of telephone cables in the Brussels district, for the Belgian Post and Telegraph authorities, the lowest offer in both cases being that of the Deutsche Kabelwerke Gesellschaft, of Lichtenberg, Berlin.

Chase Town.—The Staffs. Education Committee on Saturday accepted the tender of the Electric Construction Co., Ltd., for electric plant and machinery for the Mining Institute at Burntwood, at £365.

Colwyn Bay.—The U.D.C. has accepted the following tenders for extensions at the electricity works :—

Browett, Lindley & Co., Ltd.—Steam set, £650 (dynamo by Messrs. Dick, Kerr & Co., £328), and field coil, £13.
Bertram Thomas.—Extension of switchboard, £125.
R. Hughes-Williams.—Engine-room extension, £157.

Douglas (Isle of Man).—The Tramways Committee of the T.C. has accepted the tender of Messrs. Milns, Voss & Co. for a single saloon tramcar with improved lighting, at £251.

Durham.—The Education Committee of the Durham County Council has accepted the tenders of Messrs. F. Reid, Ferens and Co., Sunderland, for the electric light installations at its schools, viz., New Training College and Hostel for Women, at Durham, Easington Schools, Fatfield Schools, Wingate School, Wheatley Hill School, Newbottle School, and Peases West.

Glasgow.—With reference to our note under this heading last week, we learn that the contract placed with Messrs. James Howden & Co. was for a set of "Howden-Zoelly" turbo-alternators, not "Rateau-Zoelly." Further, orders for *four* boilers each were placed with both Messrs. Howden and Messrs. Babcock & Wilcox—not two each.

Harrogate.—The T.C. has accepted the tender of the British Thomson-Houston Co., Ltd., for a 1,250-KW. horizontal turbo-alternator, at £4,279. The tender of the same firm to reconstruct and rewind the generator of the present vertical set, at £612, has also been accepted.

Horsham.—The U.D.C. has decided to obtain all sizes of meters from the Electrical Apparatus Co., Ltd., for the next 12 months.

Huddersfield.—The Markets and Fairs Committee has accepted the tender of Messrs. E. Brook, Ltd., for a three-phase electric motor for the cold stores.

London.—HAMMERSMITH.—The Electricity Committee received the following tenders for cable ducts :—

Builders' Material Association		£234
H. R. Mansfield	(accepted)	231
Sharp, Jones & Co.		233
Oates & Green, Ltd.		234
Sessions & Sons		234
J. Woodward, Ltd.		234
Albion Clay Co.		234
Doulton & Co.		234
John Knowles		—
J. R. Fyfe & Co. (plain joint)		151

Arc lamp globes are ordered from Messrs. Johnson & Jorgensen, Ltd., and electric light sundries from the B.T.H. Co.

For cable joint boxes and fuse boxes, the prices quoted were :—

W. Lucy & Co.	(accepted) £496
Sykes & Sugden, Ltd.	533
B.I. & Helsby Cables, Ltd.	647
Callender's Cable & Construction Co., Ltd.	682
Siemens Bros. & Co., Ltd.	757
W. T. Glover & Co., Ltd.	1,284

The tender of Messrs. Chamberlain & Hookham, Ltd., for ordinary meters from 3 to 500 amps. has been accepted, also that of the Electrical Co., Ltd., for meters (hour).

The General Electric Co., Ltd., is to supply insulated wires for £147; there were four higher tenders ranging up to £216.

Mexborough.—The Electricity Committee has accepted the tender of Messrs. G. H. Smith & Sons, for extensions to the electricity works, at £3,891.

Peterborough.—Messrs. Callender's Cable Co. have secured the contract for the cable for the lighting of the new bridge over the Great Northern main line at Peterborough, for £187.

Redditch.—The Worcestershire Education Committee has accepted the tender of Messrs. J. Andrews & Son (£94) for installing electric light at the new school.

Southend-on-Sea.—The T.C. has accepted the tender of the British Thomson-Houston Co., Ltd., for a switchboard, at £81; that of Mr. Geo. Waller, of Stroud (Glos.), for screening and elevating machinery, at £831; and those of Messrs. Dawson and Manfield, of Manchester, for new refuse destructor cells, at £1,760.

West Ham.—The T.C. has accepted the tender of Messrs. Leslie & Co., at £1,235, for pipework, &c., in connection with the river service. The tenders of Siemens Bros. Dynamo Works, Ltd., and Messrs. Chamberlain & Hookham have also been accepted for an annual supply of house service A.C. wattmeters.

FORTHCOMING EVENTS.

Royal Institution.—Saturday, March 1st.—At 3 p.m. Lecture on "The Properties and Constitution of the Atom," by Prof. Sir J. J. Thomson. (Lecture IV.)

Friday, March 7th. At 9 p.m. Discourse on "Photography of the Paths of Particles Ejected from Atoms," by Mr. C. T. R. Wilson.

Saturday, March 8th. At 3 p.m. Lecture on "The Properties and Constitution of the Atom," by Prof. Sir J. J. Thomson. (Lecture V.)

Salford Technical and Engineering Association.—Saturday, March 1st. At 7 p.m. At the Royal Technical College, Salford. Lecture on "Wireless Telegraphy," by Mr. J. McKeever.

Society of Engineers.—Monday, March 3rd. At 7.30 p.m. At the I.E.E., Embankment, W.C. Presentation of premiums by Mr. J. Kennedy. Presidential address by Mr. A. Valon.

Institution of Mechanical Engineers.—Tuesday, March 4th. At 8 p.m. Paper on "City Passenger Transportation in the United States," by Mr. G. D. Snyder.

Institution of Electrical Engineers (London).—Thursday, March 6th. At 8 p.m. Paper on "Recent Developments in the Street Lighting of Manchester," by Messrs. S. L. Pearce and H. A. Ratcliff.

(Manchester Students' Section).—Tuesday, March 4th. At 7.30 p.m. At the Municipal School of Technology, Manchester. Paper on "Practical Testing of Transformers," by Mr. W. Parry.

(Glasgow Students' Section).—Tuesday, March 4th. At 8 p.m. At the Royal Technical College, Glasgow. Annual general meeting. Paper on "Illumination," by Mr. N. McCaskill.

(Students' Section, London).—Wednesday, March 5th. At 7.45 p.m. At the Institution. Paper on "Electrical Heating and Cooking Apparatus," by Mr. S. M. Hills.

Charing Cross, West End and City Electricity Supply Co., Ltd.—Friday, March 7th. At 8 p.m. Staff Smoking Concert. The Pillar Hall, Victoria Station (S.E. and C. Railway).

Association of Electrical Station Engineers.—Friday, March 7th. At 8 p.m. At Exeter Café, Deansgate, Manchester. Meeting to form Manchester branch.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION)

Commanding Officer—LIEUT.-COL. H. M. LEAF.

The following orders have been issued for the current week :—

Monday, March 3rd.—"A" Company. Recruit training, 7 to 10 p.m.; company training, 7 to 10 p.m.

Tuesday, March 4th.—"B" Company. Company training, 7 to 10 p.m.

Thursday, March 6th.—"C" Company. Recruit training, 7 to 10 p.m.; company training, 7 to 10 p.m.

Friday, March 7th.—"D" Company. Company training, 7 to 10 p.m.

Saturday, March 8th.—Headquarters will be open from 10 a.m. till 12 noon for regimental business.

(Signed) P. H. CAMPBELL, Capt. R.E., and Adjt.
For Officer commanding L.E.E.

The Post Office Railway Scheme.—The *London Gazette* for February 25th contains the full particulars of the scheme proposed by the Postmaster-General for the construction of electric underground railways for the service of the Post Office, which is to form the subject of an application in the 1913 Parliamentary Session.

NOTES.

British Manufacturers in Australia.—The Australian Association of British Manufacturers and their Representatives held its annual meeting on February 7th, at Melbourne. The report for 1912 then submitted showed a balance in hand amounting to £148. The Association is preparing for distribution among buying houses, &c., throughout Australia, a directory of members of the Association. Seven thousand five hundred copies will be circulated, and it is believed that both members of the body, and British trade in general, will be benefited by purchasers being enabled to ascertain with the minimum of trouble where their requirements may be procured from British sources. It is also hoped that the Association membership will be added to in consequence of the greater publicity thus given to its doings, and if additions to the membership are found to justify such a course, the publication may be issued annually. The following other matters are referred to in the report:—

Tariff.—It was expected that a revision of the tariff would be undertaken by the Commonwealth Government during the year, but such has not been the case. With the approaching Federal elections, it is impossible to forecast whether or not anything in this direction will be done during the ensuing year, but representations have been made by the Association regarding a large number of items in which members urge for alterations in the present tariff, and have been promised by the Minister "careful consideration when the tariff is next under review."

Government and Municipal Tenders.—The matter of putting up a cash deposit on tendering for Government and municipal contracts, and increasing same in the event of acceptance, has been receiving the attention of the Executive Council, and expressions of opinion have been obtained from members interested; but as there appears to be a considerable difference in members' views, it is proposed to call a meeting at an early date to decide what steps should be taken.

Statistical Information.—During the year statistical tables, relating to the trade of the United Kingdom with the Commonwealth in items in which there is competition with foreign countries, for the years 1910 and 1911, have been prepared by H.M. Trade Commissioner in Australia, and distributed by the Association to members and others. These figures have been found of considerable value and interest to members, and it is intended to supply members with similar figures annually. It may also be mentioned that more detailed figures relating to the particular trade of individual members may be obtained from the secretary.

Many matters have been and are being dealt with to the benefit of British trade, the details of which it is not advisable to make generally known. A system has been inaugurated whereby early information is obtained from the Department of Trade and Customs regarding tariff decisions, rulings and alterations, and all such information is passed on to members interested at the earliest possible moment. The Executive Council feel very pleased with the progress which has been made by the Association, and with its reception in official and other quarters, and feel confident that, given the support of representatives of British manufacturers and of their principals in the United Kingdom, much useful work will be accomplished and the Association will become a powerful factor in connection with trade between the United Kingdom and the Commonwealth.

Mr. Percy Rosling, the president, was up for re-election. Mr. R. H. Butler, the secretary, if addressed at the new permanent offices of the Association—430, Little Collins Street, Melbourne—will be only too pleased to forward to principals in this country information relating to membership, &c. There are now 195 members, 105 of these being British manufacturers, and 90 representatives of British manufacturers, and the annual subscriptions amounted to £348

The E.T.B.I. and National Insurance.—The Secretary of the Electrical Trades Benevolent Institution (Mr. F. B. O. Hawes) recently laid before the Committee a report regarding the bearing of the National Insurance Act on such persons as benefit by the Institution. The position of the working classes is, of course, different, and for the sake of brevity, the benefits to women, which, in nearly all cases are less than those conferred upon men, are not dealt with.

"As the unemployment portion of the Act will affect practically no members of the staff of electrical firms, its bearing need not be considered. The following observations, therefore, only refer to the health insurance portion of the Act:—

"The monetary benefits in the case of sickness conferred under the Act as regards men briefly are as follows: 'If the contributions have been paid continuously, 10s. a week is paid for a maximum period of 26 weeks, provided the insured person is under 50; if over 50 the amount is 7s. a week, and if over 60 6s. a week. When the contributions are in arrear these amounts are considerably reduced, for instance, in the case of a man who is ten contributions a year, on an average, in arrear, the sickness benefit will only be 6s. 6d. a week. Besides, other reasons may cause the insured person to receive sickness benefit only counting from some days after the commencement of the illness.

"The above figures all relate to insured persons who are members of a friendly society, and whose incomes do not exceed £160 per annum. Persons whose health is bad may be unable to get into a friendly society, and in such an event become deposit contributors. Speaking generally, the person of bad health who is a deposit contributor obtains practically no monetary benefits from the National Insurance Act, owing to the fact that a very small irregularity in the payments of the contributions prevents such benefits being given, and a person in bad health is certain to be irregular in his payments.

"It will be seen that the benefits mentioned above are far too small to meet the requirements of the average person employed on the staff of an electrical concern, and it may be taken for certain that in the case of an extended illness, assistance of some other kind would be absolutely necessary in spite of the fact that the employer and the employé had both been compelled to pay the Insurance contributions.

"The grants made by this Institution are those which the Committee considers are required to meet the individual wants of each case.

"Persons who apply to this Institution for assistance have generally been outside the scope of the Insurance Act for several years, and consequently their position is in no way altered by the existence of the Act. They are generally people who have lost their capital through misfortune of some kind or another, or persons who have been receiving good salaries, but have lost their appointments owing to ill-health, and are unable to obtain employment.

"The advantage of this Institution as regards the employer who has come to grief, needs no demonstration. The Insurance Act, of course, will never do anything for him.

"The above observations relate only to temporary relief. In considering the whole subject, it is frequently forgotten that the principal object of the Electrical Trades Benevolent Institution is to grant pensions. This is a matter which the Insurance Act mentions as a possibility, but there is nothing in it to indicate that pensions will ever be paid, or to indicate whether they are likely to be of a sufficient amount to be of any practical use to anyone who has been in the position of a member of a staff of an electrical concern.

"In view of the fact that the payments by employers and employed under the National Insurance Act will probably always be insufficient to meet the ordinary sickness benefits, the matter of pensions is left in a very uncertain state, and this Institution merits the support of those who would place pensions on a firm basis, even if they are already paying under the National Insurance Act.

"The time is undoubtedly drawing near when pensions will be required for members, and the invested funds must be very materially increased in order to meet such demands.

"In the above the position of members of the Institution has been considered, but there is a still further very important duty of the Institution, namely, pensions to the widows of members and assistance to the children. The National Insurance Act does nothing for such persons.

"In conclusion, I would ask everyone who is considering this subject to bear in mind that the Institution does not exist merely for the purpose of granting assistance during sickness or other difficulties, but that larger duties, which, up to the present, have not been exercised, are far and away beyond anything which is contemplated in the National Insurance Act. These duties can only be properly carried out by larger increases in the invested funds."

Electrical Wages in Belfast.—A local correspondent writes:—"The efforts of Belfast electricians, assisted by their organiser, Mr. Thomas Stewart, to have the wages of their fellow-workers employed in the building trade raised to £2 per week, have been successful. On Saturday last the employers concerned, with one exception, granted the increase, and electricians working for building contractors are now on the same level as electricians serving in other branches of employment."

Institution and Lecture Notes.—Birmingham and District Electric Club.—The fourth annual dinner of the Birmingham and District Club was held at the Swan Hotel on Saturday, the 15th inst. Mr. Roberts presided, supported by Mr. J. L. Morgan (treasurer of the club and secretary of the local section of the Institution of Electrical Engineers), Alderman David Shanks, the vice-presidents, Messrs. E. R. Phillips and V. D. Green, the assistant secretary, and others. Mr. Fell (of the Wednesbury Electricity Department), Councillor Lench, and others were present as guests of the club. Mr. J. Hill (past president) proposed the toast of the club, which had been in existence nine years; some of the founders, he said, were present that night. That interest in the club had never been allowed to flag was proved by the fact that over 40 papers had been given relating to the electrical industry. Mr. H. Roberts, in responding, said he thought the present competition between gas and electricity was likely to die out before long, and instead of each striving to adapt its method of illumination or power to every case, it would be acknowledged that each had its special field. For instance, in view of the present protests against the rapid rise of the Birmingham rates, there was one step, at any rate, which might be made towards economy—the substitution of electric street lamps for the present gas lamps. There were 219 lamp-lighters employed in the greater city, and they had to light and extinguish daily 22,000 lamps. Here was a case in which the advantages of electricity were manifest. Mr. V. D. Green proposed "The City of Birmingham," giving a humorous sketch of its history and recalling its associations with Boulton, Watt and Murdoch, the birth of electroplating, and other notable events. Alderman Shanks, responding, referred to the cry for economy in the City Council. Was it economy to grant £15,000 to the University and at the same time refuse an increase in teachers' salaries? Economy was not necessarily a matter confined to finance. It also bore upon another matter, as to how far the portion of the community as represented by that gathering of manufacturers and contractors was affected. It might be good to grant a sum to the University, to raise the teachers' salaries and to be progressive in all other activities and civic life. Yet they would find this meant

a still further increase in the rates, and that raised the question whether the time had not come for a very serious alteration in the methods of rating local manufacturing concerns. Manufacturers got an undue share of the burdens, and it was for them to consider whether the time had not come to put a stop to those burdens. Ground rents, for example, were not paying as heavy a share of the rates as factories. Other toasts were "The Electrical Industry," proposed by Mr. Brewerton, and responded to by Mr. Steventon, and "The Visitors," proposed by Mr. W. Y. Anderson, and responded to by Councillor Lench. Songs and recitations were given by Messrs. H. Smith, A. Whatmore, Willett Raine and F. N. Dowling, and the evening proved to be a very entertaining and enjoyable one.

Institution of Electrical Engineers (Birmingham Section).—On Wednesday last, papers were to be read by Mr. W. E. Milns on "The Economical Use of Electric Power," and by Mr. T. P. Wilmshurst on "Electrical Power, Heating and Cooking." After the meeting a demonstration of heating and cooking apparatus was given by Mr. Milns.

Manchester Section.—At a meeting of the Section on the 25th inst., a paper was read by Messrs. S. L. Pearce and H. A. Ratcliff on "Recent Developments in the Street Lighting of Manchester." A discussion followed, which was replied to by the authors.

Yorkshire Section.—On Friday last the annual dinner of the Yorkshire Local Section took place at the Hotel Metropole, Leeds, the chairman of the Section, Mr. Wilson Hartnell, presiding. Representing the Council there were present the President (Mr. W. Duddell), Messrs. J. F. C. Snell, W. Judd, J. E. Kingsbury, Robert Hammond, and the secretary, Mr. P. F. Rowell, and amongst others well known locally one may mention Mr. Harold Dickinson (late city electrical engineer), Mr. A. G. Lupton, Pro-Chancellor (Leeds University), Mr. John McLaren, Mr. E. Kitson Clarke, Mr. A. S. Keith, Mr. J. B. Hamilton (Corporation Tramways Department), Mr. W. B. Woodhouse (Yorkshire Power Co.), and Mr. W. C. Mountain, Chairman of the Newcastle Section, I.E.E.

After the loyal toasts, Mr. A. G. Lupton briefly proposed "The Institution of Electrical Engineers," referring to the world-wide use of electricity and its influence on progress generally. It seemed to him that the Institution was a descendant, in theory, of the spirit which carried on the old trade guilds, but on a more extended scale.

The President, in responding, referred to the efforts of the Institution on behalf of its members, and the pleasure which it gave him to meet and keep in touch with the members of the Local Sections. There were 73 members 41 years of ago, and now some 7,300, with whom it would be impossible to keep in touch were it not for the Local Sections. The latter also facilitated the extended discussion of matters brought forward. After referring to the work of the Electrotechnical Commission and the friendly intercourse which arose therefrom with Continental engineers, he said he hoped many of the members would take part in the forthcoming visit to Paris, the details of which were being arranged.

Mr. Robt. Hammond, to whom fell the toast of "The Yorkshire Local Section," remarked that the Institution, being flush with money, had invested £3,000 recently, and was in a flourishing condition. Yorkshire had four record works costs amongst its central stations, and the average price of electricity in Yorkshire was lower than in any other county. The chairman, in replying to the toast, dwelt on the rapidity of electrical progress, pointing out that steam engineering had required about 150 years to arrive at a similar stage of development; this might be due to the scientific study devoted to electrical matters.

In proposing the toast of "The Electrical Industries," Alderman Smithson said he had been accused of hindering the development and extension of the Leeds electricity department, but he thought they would look at the matter from a broader point of view. In his opinion it would be established on a firmer basis, and would certainly benefit from industrial electrical work, when the trade boom was past and the local manufacturers had time to think over things. After referring to local traction developments, and the introduction of railless traction, he said he believed that they were entering on an era of railway electrification. Messrs. J. E. Kingsbury and W. B. Woodhouse responded; Mr. Kingsbury remarked that the electrical industry needed no monument, it was only necessary to look round to gain some idea of its importance. He recalled an early paper by Mr. (now Sir) William Preece on the application of electricity to domestic purposes, which discussed the question of electric bells; if one compared that with the present day use of electricity, he asked what would be the future in view of the rapid development now taking place. It was a characteristic of electricity that it had to replace other methods; in every direction this was taking place, and he saw no reason for the pessimism which one found amongst electrical men. One could not overlook the fact that there had been some retardation due to legislative causes, and the item of goodwill was not always included when electrical undertakings were compulsorily transferred; he thought the electrical industry could do with some goodwill, and was entitled to it. Mr. Woodhouse said it was very generally considered that the electrical industry was on the eve of a boom in all departments, modestly adding that he had thought that it might be due to the work of the power companies.

Mr. Walter Emmott proposed "The Guests," remarking (with an eye on the clock and the extended toast list) that it was their one occasion for speech making in the year. Mr. J. F. C. Snell and Mr. E. Kitson Clarke replying.

At the conclusion of the speeches, Mr. Harold Dickinson was the recipient of a pair of silver candlesticks, presented by the Yorkshire Section of the I.E.E. of which he had been hon. secretary for some years. Mr. Dickinson, in thanking his late colleagues for their gift, referred to his connection with the Leeds Section since its inauguration, and to the great interest and ready assistance of the Council of the Institution in connection with their work.

Orchestral selections and topical songs, in the intervals of speech-making, assisted towards a pleasant evening, for which all credit is due to Mr. J. D. Bailie, the hon. secretary, and those associated with him.

Physical Society of London.—At the annual general meeting held on February 14th, the officers for the ensuing year were elected as follows: President, Prof. A. Schuster; Secretaries, W. R. Cooper and S. W. J. Smith; Foreign Secretary, Prof. S. P. Thompson; Treasurer, W. Duddell.

At the 1913 congress of the Australasian Association for the Advancement of Science, which was opened on January 7th at Melbourne University, about 550 delegates were present, representing the various States of the Commonwealth and New Zealand. A paper was read on the domestic uses of electricity, especially for cooking, by Mr. W. H. Alabaster, assistant electrical engineer to the Melbourne City Council.

Tramways and Light Railways Association.—The dinner of this Association took place last night at the Trocadero.

Association of Mining Electrical Engineers.—At a meeting of the East of Scotland branch, held at Dunfermline, on Friday last, a paper was read by Mr. E. Kilburn Scott, London, on "Electric Cables for Shafts of Mines."

The monthly meeting of the West of Scotland branch was held on Saturday last at Glasgow. Mr. James McCaan read a paper on "The Electrical Coal-Cutter; its Installation and Manipulation." The author said that there were two points which would reduce the saving effected by the use of coal-cutters. These were:—(1) That a very bad roof made cutting dangerous and expensive, sometimes impossible; and (2) the saving must be small where the coal was easily won by hand. He gave a series of hints for the benefit of machinemen:—Don't switch on too quickly, give the machine time to gradually attain full speed. If the load is very heavy, switch on slower, not faster. Don't increase the size of fuses because they blow often. It is easier to change a fuse than an armature. Don't raise or lower the cutting level in quick steps when driving a disk or chain machine; the only machine that will do this is the bar. Don't force the machine through a hard holing with blunt picks; it is quicker, not slower, to change picks. Don't neglect such trifles as a loose screw or a broken spring, because it is a small detail; either repair it or report it, because a stitch in time saves nine; and don't bury the machine in the cut because of cutting by contract. Work out the costs properly, and see if it does not pay better to cut with crown wheel clear.

Faraday Society.—On March 12th there will be a general discussion on "Colloids and their Viscosity"; Dr. R. T. Glazebrook will preside, and a number of papers will be read. The meeting will be open to members of the Institution of Electrical Engineers and of the Physical Society of London.

Annual Socials and Dinners.—Hanley.—The eighth annual dinner of the British Electrical Friendly Society (Potteries District) was held at Hanley on February 14th, Mr. F. W. Chanter, a director of the Potteries Electric Traction Co., presiding. A watch and chain were presented to Mr. C. Shorthouse, in appreciation of his work as contributors' Central Committee-man for 11 years.

Maidstone.—On Tuesday evening, last week, the employés of the Maidstone Corporation Tramways held a very successful concert, promoted by the members of the Sports Club. The room was tastefully decorated, and during the interval refreshments were served. The general manager furnished the company with tobacco and cigarettes. After a few remarks by the chairman (Mr. A. T. Lambert, general manager), a programme of music and song was carried out in an excellent manner. We understand that motorman W. Hayes "simply brought the 'depôt' down with his patter song, 'The Inquisitive Kiddy.'"

Large Continental Turbo-Alternators.—The Rheinisch-Westfalische central station, which was the first in Germany to employ 10,000-h.p. turbines, now possesses three 30,000-h.p. turbo-alternators, each of which is rated at 21,500 k.v.a.—*i.e.*, about 15,000 kw. at 0·7 power factor. The overload capacity of the turbines and generators is 25 per cent. Two of these sets have been in satisfactory operation at Dusseldorf-Reisholz since last summer, and the third set is to be placed in service at Essen. The Dusseldorf station is interesting in that its generating equipment is entirely driven by turbines, and includes three 7,150-k.v.a. units (5,000 kw. at 0·7 p.f.), and the two new units mentioned above. There is, therefore, available in five sets, 60,000 k.v.a. or 45,000 kw. at 0·7 power factor. The power house measures 80 × 180 ft. The various auxiliary pumps are driven by steam turbines or electric motors, and for these auxiliary services each 15,000-kw. set requires 280 kw. and 1,100,000 gallons of water per hour. Generation is at 5,250 volts, three-phase, and excitation at 220 volts. Comparing the dimensions of the new sets with those of the 5,000-kw. units, the remarkable advances embodied in the construction of the former may be realised:—

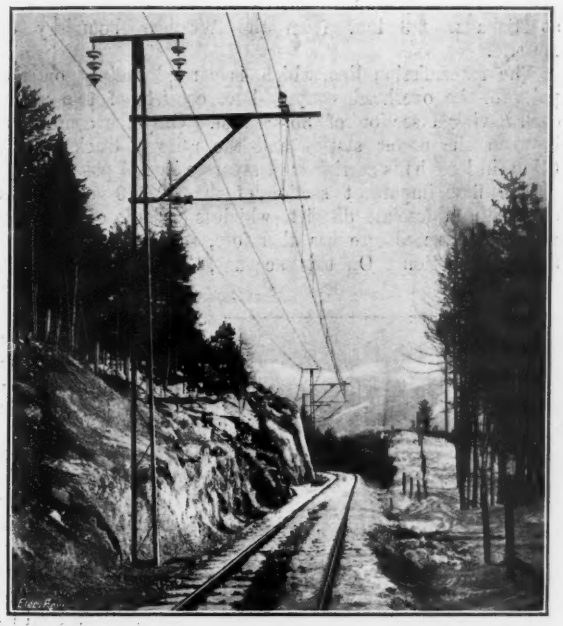
Makers.	15,000 kw. at cos ϕ = 0·7. Length. Ft.	in.	Width. Ft.	in.	5,000 kw. at cos ϕ = 0·7. Length. Ft.	in.	Width. Ft.	in.
A.E.G.	50	2	15	7	39	0	13	4
Brown-Boveri	49	10	14	0	49	1	12	4
Escher-Wyss and Siemens-Schuckert	51	0	14	6	49	1	12	4

—*E.T.Z.*

(*Continued on page* 353.)

TWO EUROPEAN SINGLE-PHASE RAILWAYS.

The Mittenwald Electric Railway.—This railway system between Innsbruck - Scharnitz - Garmisch - Partenkirchen-Griessen and Reutte is sub-divided into four lines; the eastern line from Innsbruck to Scharnitz, 33 km. long, is frequently referred to as the Karwendel Railway, and, like the western line, 32 km. long, from Reutte to Griessen, passes through Austrian territory; between these lines comes the Scharnitz-Griessen section, which runs through Bavaria and has a length of about 40 km. This curious interconnection of the sections lying in different countries is, of course, emphasised in the electrical equipment and the arrangement of the service.



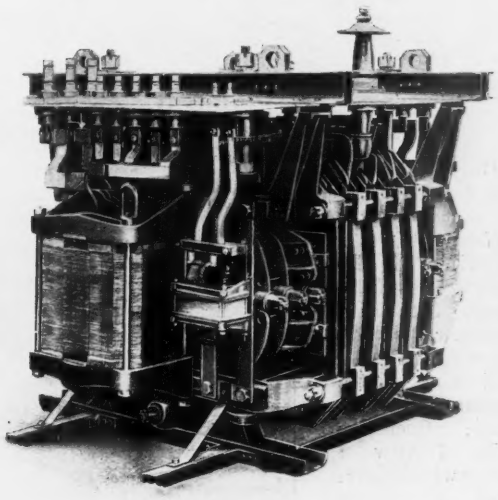
Typical View, Mittenwald Railway, Showing Power Transmission Line.

On the Austrian sections there are 18 tunnels with a total length of 4,305 metres, one of which alone is 1,787 metres long. In addition there are numerous viaducts and bridges.

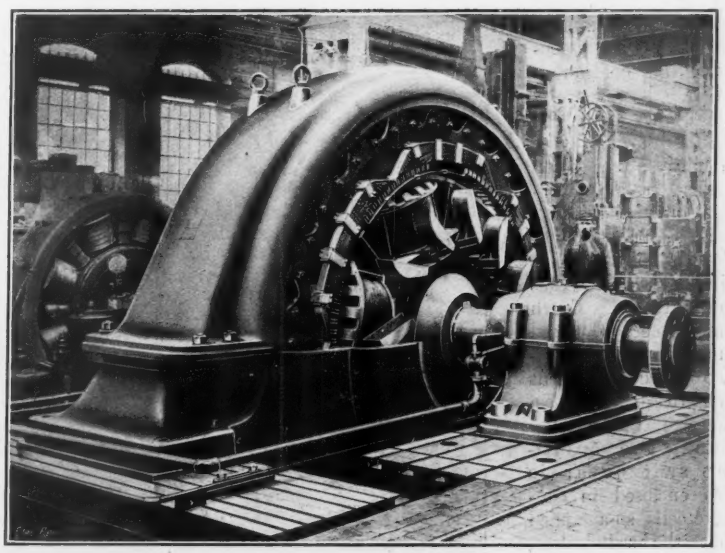
The constructional difficulties formed one of the reasons for the selection of electric traction. This, in fact, allowed the railway track to be better adapted to the nature of the ground and permitted a gradient of 36·4 per mille to be used on a large scale; the railway reaches a height of 1,185 metres above sea level at Seefeld, so that in a distance of 21·2 km. a difference of 600 metres has to be overcome. The adoption of steam traction would have necessitated the lengthening of the line by at least 4 km. just at the most difficult part, and the saving effected amounted to more than the total cost of the electrical equipment. Another factor making electric traction more economical is the cheap water power, the Tyrol occupying a still more unfavourable geographical position as regards coal supply than the adjoining country of Bavaria.

The Mittenwald Railway possesses a power station of its own, which is situated about 6 km. to the south of Innsbruck in the vicinity of the Sill Works, and utilises the power of the Ruetzbach, a river close to the Sill.

In the Ruetz Works two 4,000-h.p. Voith-Pelton turbines have been installed for the time being, which are direct-coupled to single-phase generators with continuous outputs of 3,000 k.v.a. and maximum outputs of 4,500 k.v.a. The turbines and generators have been designed with due regard to the special conditions involved in railway operation, so that the plant cannot be endangered by heavy short-circuits or sudden alterations of load. The generators, which ran at a speed of 300 r.p.m., have six poles corresponding to the frequency of 15 cycles per second, which entails a somewhat higher cost as compared with the four-pole type, but enables the pole cores to be fixed with absolute rigidity to the rotor hub. The generators are wound for a pressure of 3,000 volts, and are self-ventilated, the magnet wheel being fitted with fan blades, and the stator enclosed by covers.



Loco. Transformer, with Tank Removed.



Generator for the Ruetz Power Station in the Shops.

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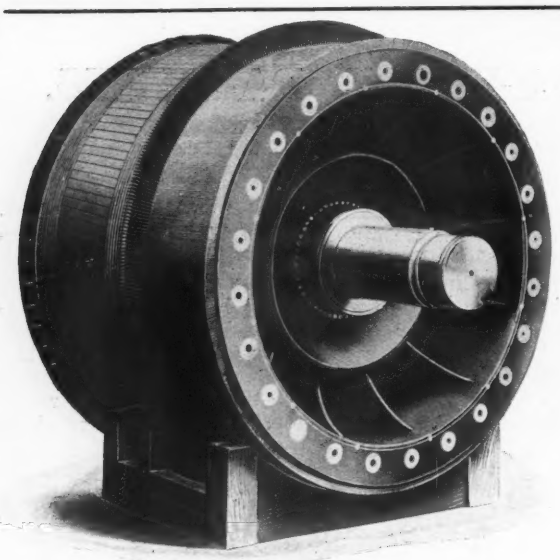


Rotor for 800-h.p. Motor.

On entering the power station, one is struck by the perfectly noiseless running of the generators. The energy from each generator is led to a transformer which raises the pressure to 50,000 volts; from the point of view of the switchgear, each generator forms a separate unit with its transformer. As there are, therefore, no bus-bars or switches for 3,000 volts, extreme simplicity in switching operations is ensured.

Each transformer has the same maximum output as the generator, the continuous rating, however, is 1,800 k.v.a. The transformers are of the core type with disk windings and have oil and water cooling. The core with its windings is 23 tons in weight. Each transformer is placed in a separate fireproof compartment provided with an effective air circulation; the 50,000-volt switchgear is also enclosed in concrete cells, so arranged that the switchroom, in the event of a breakdown, may be entered from two sides without danger. Switches are only provided on the 50,000-volt side; for the transmission line these switches are doubled.

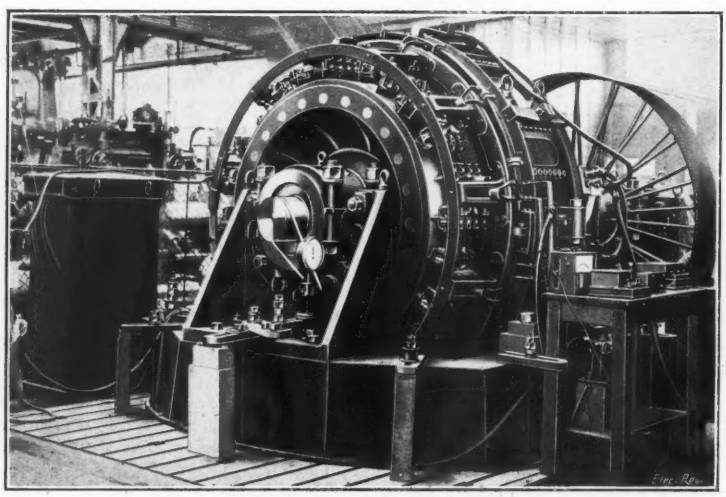
All switches have electromagnetic remote control operated from the switchboard in the engine-room; they are fitted with automatic overload releases which can be adjusted for a time limit and are also arranged for hand operation. Lightning arresters, excess pressure dischargers and choking coils for checking short-circuits are provided.

The energy generated at the power station is carried by a 50,000-volt line to two transformer stations where it is stepped down to the contact line pressure of 15,000 volts. The transformer stations, which will also supply current to the Bavarian line pending the completion of the Walschensee Works, are situated at Reith, 19 km. from the Eastern, and at Schanz, 3·3 km. from the Western boundary of Austria.

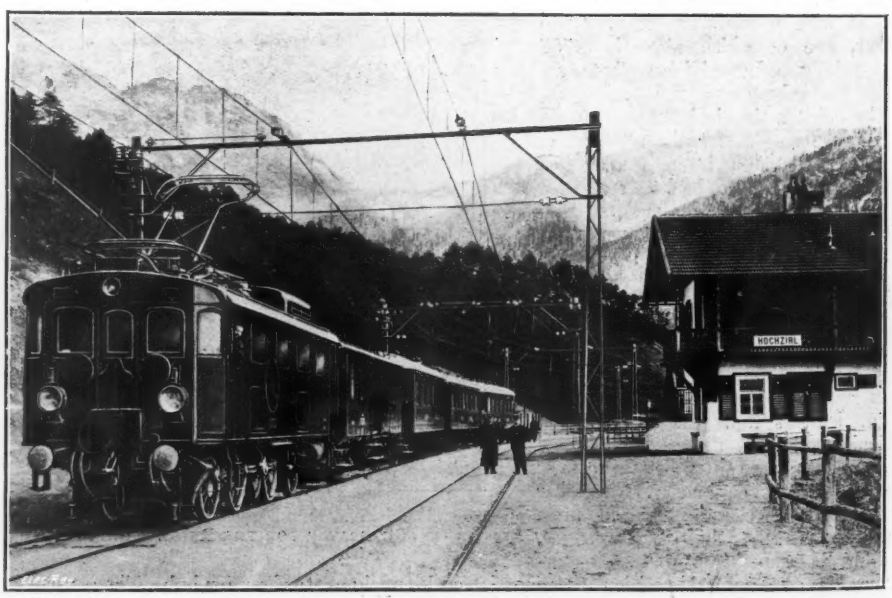
The transmission line, which is carried mainly on the poles for the overhead contact line, consists of two wires, each having a section of 35 sq. mm. Only the connection between the power station and the railway track (about 6 km. in length) is carried on a separate line of poles.

The first important section of the 50,000-volt line is situated in a desolate district, which is difficult of access in winter; increased care was, therefore, required in its design and construction. On this account, the line in this part consists of three wires, two of which are usually in service, the third serving as reserve to replace a defective wire.

As a protection against atmospheric discharges, a copper earthing wire is mounted above the h.t. line on the tops of the poles, and is carefully earthed to the depth of ground water at each pole. Lattice poles are employed exclusively for carrying the line, and are erected at distances of 80 metres apart; every fourth or sixth pole will stand firm, even



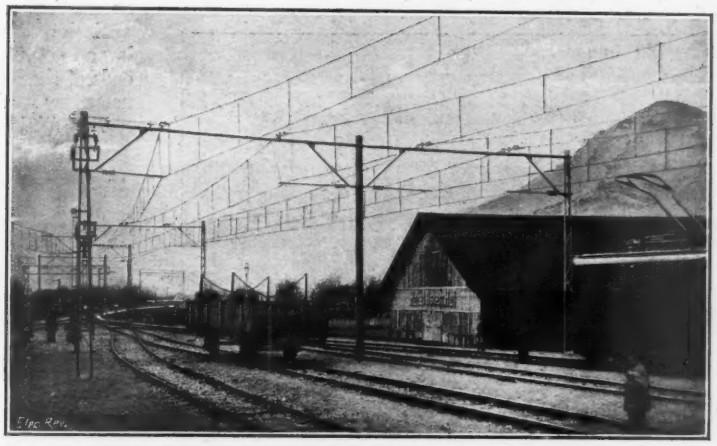
800-h.p. Loco.-Motor on Test-Bed.



Locomotive and Train, Mittenwald Railway.

when the line breaks on one side, the intermediate poles being flexible. The 50,000-volt line, for the section from 8·8 km. to 16·3 km. on the Innsbruck-Scharnitz line, has also been erected on a special row of poles, the number and length of tunnels in this section being too considerable for the line to be laid out on the contact line supports.

On account of the transmission pressure of 50,000 volts, which is rather high for Continental practice, special care had to be taken in choosing a suitable type of insulator, as far at least as its mechanical strength was concerned. The overhead line follows a series of sharp curves, and the poles have to stand the jerks produced by the swift motion of the current collectors. Investigation showed that only chain-link (disk) insulators would stand this heavy stress, no part of these insulators being exposed to traction or inflection strains. The type of insulator ultimately developed by the A.E.G.-Union Co. possesses a breaking strength of 7,800 to 8,000 kg. with a weight of only 2·8 kg. Moreover, it also possesses excellent insulating qualities.



Contact Line at Shunting Station, Mittenwald Railway.

An essential difference between this insulator and those used by American engineers is that the channels are not of circular cross-section, and instead of a wire rope exposed to rusting, steel bands applied throughout their width on the porcelain (so as not to injure the enamel) are used to fix it. After fitting the insulators in position, the channels are filled in, thus preventing any water from entering and freezing within the insulator. Another distinctive feature is the flexible armature of the insulator, which absorbs all shocks, thus preventing any damage to the enamel.

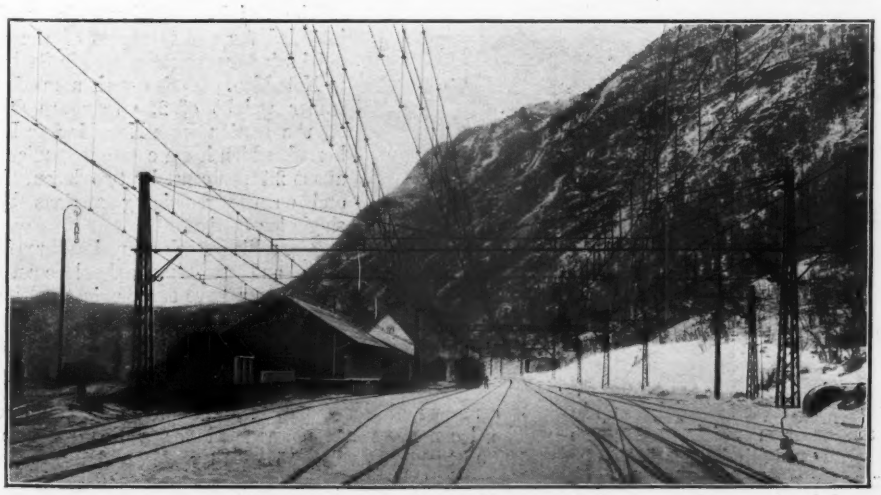
Chain suspensions, without any automatic tightening devices, are used for the contact wire, which is exclusively carried by lattice poles.

The rolling stock of the Mittenwald railway at present comprises nine locomotives, each of a normal output of 800 H.P. As previously mentioned, the maximum gradient of 36·4 per mille is found extensively on this railway; each locomotive will haul over this gradient a gross train weight of 124 tons at about 30 km. per hour, which corresponds to a tractive effort of about 7,500 kg. What this performance really means will be gathered from the fact that the locomotives during several months' experimental work on the Dessau-Bitterfeld Railway hauled goods trains of 1,100 tons in schedule time over the level track.

Each locomotive, inclusive of the driver and the oil and sanding tanks has a weight of 53 tons in working order.

The current is taken off the overhead wire by two bow collectors each having two sliding sections, and is conducted by a bare high-tension wire arranged above the roof, to a lightning arrester choking coil, and thence into a transformer room where the line is connected up to the H.T.

The Rjukan Single-phase Railway.

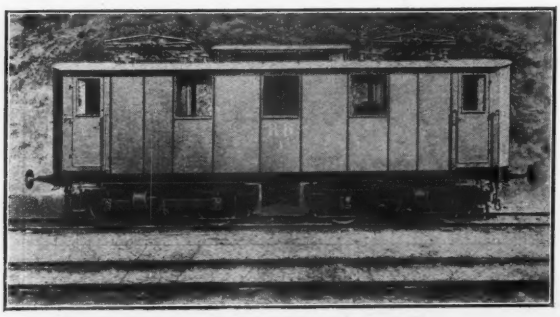


Arrangement of Contact Line, Saaheim Station; Rjukan Railway.

oil switch. The latter has a quadruple break, and includes an extra resistance for reducing any strain produced in switching in the transformer. From the front driver's platform the oil switch is operated directly by the switch lever; from the rear platform it is switched out by a button fed through a series resistance from the controller coil, while a lever system is used for switching in. Between the lightning arrester coil and the oil switch there is inserted a grounding

switch operated automatically as soon as the protective cap of the oil switch is removed.

The driving motor is a 12-pole single-phase commutator machine of 800 H.P. normal output, at a speed of 30 km. per hour. It is designed on the A.E.G. system, in accordance with which (contrary to directly-fed pure series motors), the



Single-phase Locomotive, Rjukan Railway.

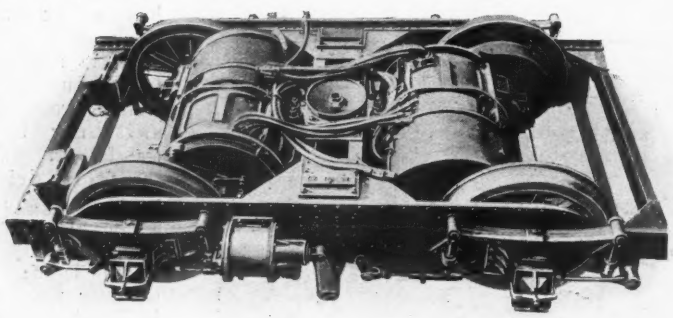
current in the armature is induced by transformer effects. The rotor winding is, in fact, closed by short-circuiting brushes, thus obtaining the secondary winding of a transformer, the primary winding of which is the field winding of the stator.

Excitation is effected from the rotor, current being supplied to the armature through another pair of brushes from a special exciter transformer connected up in series with the stator winding. The armature slots are nearly closed, and are arranged slanting to the direction of the axis.

Regulation of the motor speed is effected by altering the supply pressure by means of contactor switches, which are connected up to tappings of the power and exciter transformers, and are actuated by the controlling current. The controlling current is derived from a special (300-volt) coil of the power transformer.

Each of the two controllers has two separate switch-drums, one of which operates the contactor switch of the power transformer, and serves to regulate the power consumption, whereas the other operates the exciter switches, thus controlling excitation. The exciter drum moves the reverser into its proper position in a preliminary stage to "forward" and "backward" respectively. Each of the two switch-drums is entirely self-contained, so that any position of one can be combined with any position of the other, thus obtaining a minimum K.V.A. consumption for each speed of the motor.

The contactor switches are electrically interlocked by auxiliary contacts, so that the working of any one group interrupts all the remaining switch coils.

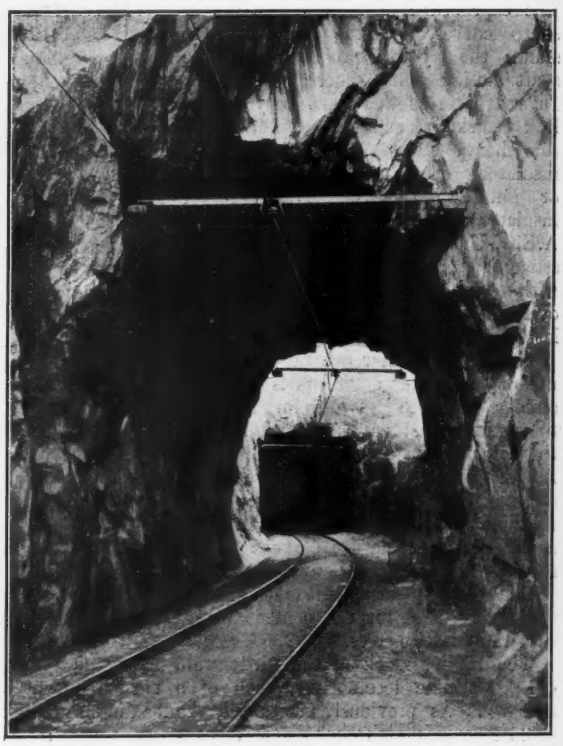


Showing Arrangement of Bogie Truck.

Provision is made for two locomotives to be joined up in multiple connection for hauling train weights of up to 250 tons. This arrangement allows both locomotives to be controlled by a single driver. The conductors for the motor-compressor and the lighting and heating of the locomotives are connected up to the same switchboard with the controller circuit and are fitted with hand switches. All these circuits are fed from the 300-volt controller coil, which has a 19-volt tapping for the lighting circuit. The motor-compressor, which supplies compressed-air for the Westinghouse and Henry brakes, as well as for actuating the current collectors, sanders and signal whistles, is thrown into and out of circuit automatically.

Each of the radiators provided for heating the locomotives has an output of 1 KW. Heating sockets are provided at the ends of the locomotives for heating the train, which are connected up to the cars by coupling cables.

The Rjukan Railway.—This is the first standard gauge



Tunnel on the Rjukan Railway, near Notodden.

electric railway in the South of Norway to be installed on the single-phase system. It comprises two sections separated by the Tinn Lake, the northern section (from Saaheim to the Tinn Lake) being the Vestfjorddals Railway, 16 km. in length, and the southern section, about 30 km. long, the Tinnos Railway, running from Tinnoset to Notodden, along the Hitterdals Lake. A ferry across the Tinn Lake will connect the two sections.

The Rjukan Railway is mainly intended for the transport of the artificial saltpetre manufactured in Saaheim, to Notodden. Trains with a maximum trailer weight of 290 tons are drawn on the section from Notodden to Lilleherred, which has a constant gradient of about 2·7 per cent. by two locomotives, and on the remaining sections by a single locomotive.

The rolling stock comprises three four-axle, and two two-axle locomotives. The former have two bogie trucks, and are fitted with four alternating-current motors, each having an hourly rating of 125 H.P., and weighing approximately 46 tons. The two-axle locomotives have two motors of the same size, and weigh about 23 tons. The locomotives are constructed for a line pressure of 10,000 to 11,000 volts, 15 to 16 cycles, and are designed for contactor control.

The track equipment consists of a single catenary suspension overhead contact line, the distance between the poles

being about 60 metres. On some sections bracket suspension is used, while on others cross-suspension is employed. We illustrate the form of suspension adopted for the overhead line in a tunnel.

The power supply is derived from a separate converter station for each section of the line, only 50 cycles, three-phase current at a pressure of 10,000 to 11,000 volts being available; the converter station feeding the northern section is situated at Vestfjorddalen, and contains two converter sets. Each of these comprises a three-phase transformer which steps down the pressure from 10,000 to 5,000 volts, and feeds an asynchronous motor driving an alternating-current generator with an output of 400 K.V.A., which supplies the line. The converter station receives its energy from the Rjukan power station, which is about 5 km. distant.

The southern section is fed from the Svaelgfos converter station, which is situated in the same building as the power station and consists of three converter sets similar to those above described.

Both the railways described were equipped by the A.E.G.

NOTES.

(*Continued from page* 348.)

Wholesale Traders' Association.—We have received a copy of the report which was adopted at the annual meeting of this Association, which watches over the interests of the hardware, furnishing and metal industries (and has an Electrical Trades Section), at Birmingham on Monday. The number of inquiries as to status of customers handled during the year was 127,846. In regard to "long firms" who are continually defrauding the trading community, it is remarked that "in most instances these frauds could be checked in their earlier stages if only victims would at once lay the circumstances before the Association and co-operate with its officers in bringing the offenders to justice." In the debt recovery department, there were placed in its hands for collection during the year 34,500 debts, amounting in all to £283,341, out of which no less than £174,873 was recovered without legal proceedings. A speciality is made of collection of debts in Scotland, Ireland, and abroad. Mr. T. Cumberland is the chairman of the Association, and Mr. C. G. Poppleton is secretary. The offices are at 26, Corporation Street, Birmingham.

The Manchester Electro-Harmonic Society.—We congratulate this Society on its most successful concert, held on Friday evening last. We understand that it was undoubtedly the best of the season. The large audience, something like over 300 being present, was a very gratifying feature, and further members were enrolled. The programme consisted of classical music for strings and piano, interspersed with high-class songs, while we have it on the best of authority that, perhaps, the finest item was Mr. Hamilton Harris's rendering of Schubert's "The Wanderer." Amongst the audience were Alderman Walker (vice-chairman of the Electricity Committee), Mr. Eckstein, Mr. Bruce Anderson and Councillor Westcott. In the unfortunate absence of Mr. Pearce, Mr. William Cramp took the chair, and his masterly control of the meeting assisted in a very great measure to make the success of the evening. A vote of thanks was accorded to the musical director (Mr. W. J. Smith) and Mr. J. Hill (secretary) with great acclamation. Mr. J. W. Rook (of London) proposed, and Mr. T. Cartwright (of Glasgow) seconded, a vote of thanks to the chairman, which was equally well received, and carried with musical honours. The next concert, and the last of the season, will be held on March 28th, when Mr. T. S. Sells will be in the chair.

New Associations.—The inaugural meeting of the Production Managers' Association was held yesterday (Thursday) evening, at the Holborn Restaurant, when, after various proceedings had been carried through relative to the formation of the association, it was intended to have a discussion, introduced by Mr. J. W. Stannard, on "American Methods *v.* British Conditions." The secretary *pro tem.* is Mr. Chas. F. Warren, of 42, Queen Anne's Chambers, S.W.

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"Exhibitions, for the manufacturer, invariably involve a very appreciable burden of direct expenditure, not alone in money, but of time and energies, usually of their most able officials; so that however beneficial exhibition gatherings may be to buyer or to seller, there is a limit beyond which the disadvantages outweigh the good which the industry may effectively derive. Furthermore, many of the large International Exhibitions are a comparatively worthless burden upon manufacturers of tramway and railway material, and it is necessary that the decision of the Association should be issued advising manufacturers whether to partake in any particular exhibition or not. The Council having been influenced by the fact that manufacturers other than British *do* actually take their part in the supplies of tramway and railway material purchased in Great Britain, they have decided to admit to the Association, and thereby control, foreign manufacturers. The Council have noted with admiration the well-recognised work of the British Electrical and Allied Manufacturers' Association, to whom they will probably look, not without avail, for advice and assistance in relation to the particular electrical specialities enumerated in the publications of that Association; but in regard particularly to the enormous quantities and kinds of manufacture for tramways and railways other than electrical, it is felt that a purely British policy would be narrow to a decidedly detrimental degree. 'An examination of the lists of membership of Associations which are avowedly "British" reveals the prominent position taken by members who can by no proper construction be lending their aid out of an enthusiasm for the British, unless it be taken to mean the British *buyer*.'"

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Appointments Vacant.—Fire wire lineman, for the Leyton U.D.C. (32s.); rolling stock and works superintendent, for the Liverpool Corporation Tramways (£350); correspondence clerk for the Corporation Electricity and Tramways Department (Swindon) (£58 10s.). See our advertisement pages in this issue.

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being about 60 metres. On some sections bracket suspension is used, while on others cross-suspension is employed. We illustrate the form of suspension adopted for the overhead line in a tunnel.

The power supply is derived from a separate converter station for each section of the line, only 50 cycles, three-phase current at a pressure of 10,000 to 11,000 volts being available; the converter station feeding the northern section is situated at Vestfjorddalen, and contains two converter sets. Each of these comprises a three-phase transformer which steps down the pressure from 10,000 to 5,000 volts, and feeds an asynchronous motor driving an alternating-current generator with an output of 400 K.V.A., which supplies the line. The converter station receives its energy from the Rjukan power station, which is about 5 km. distant.

The southern section is fed from the Svaelgfos converter station, which is situated in the same building as the power station and consists of three converter sets similar to those above described.

Both the railways described were equipped by the A.E.G.

NOTES.

(*Continued from page* 348.)

Wholesale Traders' Association.—We have received a copy of the report which was adopted at the annual meeting of this Association, which watches over the interests of the hardware, furnishing and metal industries (and has an Electrical Trades Section), at Birmingham on Monday. The number of inquiries as to status of customers handled during the year was 127,846. In regard to "long firms" who are continually defrauding the trading community, it is remarked that "in most instances these frauds could be checked in their earlier stages if only victims would at once lay the circumstances before the Association and co-operate with its officers in bringing the offenders to justice." In the debt recovery department, there were placed in its hands for collection during the year 34,500 debts, amounting in all to £283,341, out of which no less than £174,873 was recovered without legal proceedings. A speciality is made of collection of debts in Scotland, Ireland, and abroad. Mr. T. Cumberland is the chairman of the Association, and Mr. C. G. Poppleton is secretary. The offices are at 26, Corporation Street, Birmingham.

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vinced that more work could easily be done, the same man was promised one penny per unit for every unit he did. This was to be additional to his wages, which still remained at 35s. even if no units of work were accomplished, as might happen if a breakdown occurred. The first week on the new system showed 48 units of work done, and the man received 39s. The next week only 24 units were done, owing to some special difficulty. His pay was, therefore, 37s. This began the trouble. He had "been done out of 2s.," and was miserable and discontented, and declared he would have no more of it, but would go back to his regular pay of 35s., and would not have any bonus. Now, in two weeks he had averaged over 8 per cent. additional pay, and he was upset by it. He could not stand an irregular rate of pay, though he was never to have less than his old 35s. It seems incomprehensible, but the above are the facts, and there was nothing said to the man to cause discontent.

"The same man having one week to receive 39s. 11d. for wages and certain expenses was given a couple of sovereigns, and asked for the change of 1d. Nothing could get it from him. He could not give back a penny without feeling injured; and when it was pressed for, he finally parted with a curious bit of elliptical copper bar bearing an Indian device, and collected by him years before. This is still in the writer's possession, and serves as a reminder of what a workman will do.

"Recently a man came literally begging for a job. He was given one. By luck he got another job before the next day, when he was to have made a start. He did not even inform the man who had given him the first job, but left him to find it out by not turning up to the job. Thus, the employer was left in the lurch. The same man, only a few days ago, was begging again for a job from the very man he had served so badly.

"Thus, these two men afford three instances of the workman's ways of thought, and probably every employer could add numbers of cases equally curious and puzzling. Schemes for profit sharing only upset great numbers of the men to whom they are offered, and are better left alone. Many men on receiving a bonus will go and spend it forthwith on a fiery fuddle, and then curse the man who has brought them to this state by disturbing the regular stream of wage-earning life. When sober again they will curse their careful fellowmen who have saved the bonus. Now, the Trade Unions appear to be dominated by men of a curious twist of mind, and the fairest systems of profit sharing stand a poor chance of success. One would like to know how Sir Geo. Livesey succeeded.

"Piecework, of course, will not always answer, for it is too usual to cut the price when a man earns "too much." As part of this question, the writer has been informed on credible authority that there is a black list system in nearly every town, and men against whom there is no real fault to be found, will be driven out of the town by this black listing. It is more particularly rife in the machine-tool shops."

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—Appreciative reference was made last week by the Mayor of Darwen (Mr. Fritz Hindle) to the work of MR. BOYCE, the assistant electrical engineer, who is about to leave the town to take up the management of the electricity works at Todmorden.

MR. PERCY TAYLOR will be appointed to succeed MR. JOSEPH BOYCE (now of Todmorden) as chief assistant engineer at the Darwen Electricity Works. Mr. Taylor has been a member of the works staff for some years.

MR. J. D. SPARK, assistant mains superintendent at the Croydon Electricity Works, has been appointed mains superintendent to the Swansea Corporation Electricity Department.

On Friday, February 14th, the staff at the St. Pancras Borough Electricity Works presented to MR. W. E. RUSSELL, shift engineer, an engraved silver cigarette case, on his leaving to take up the position of shift engineer at the Davies Street station of the Westminster Electric Supply Corporation.

MR. H. T. BATES, resident engineer at Sutton (Surrey) to the South Metropolitan Electric Tramways and Lighting Co., who has been appointed resident manager to the Rothesay Tramway Co., has been presented by his colleagues with a marble clock.

MR. J. PHILLIP, assistant manager of the Fife Electric Power Co. at Dunfermline, has received an important appointment under the Derby and Nottingham Power Co. He went to Dunfermline from Dundee.

On the occasion of his leaving to take up the post of senior switchboard attendant to Salford Corporation, MR. S. R. HOWARD, of the Kilmarnock Electricity Works staff, was on February 12th presented by the members of the staff with a Masonic seal and travelling bag. Mr. W. C. Bexon, chief engineer, made the presentation, referring to Mr. Howard's long connection with the works. On February 22nd MR. D. SINCLAIR, accounts clerk, was presented with a set of books and a fountain pen, on the occasion of his leaving Kilmarnock to take up a better position at the Worksop U.D.C. Electricity Works. Mr. Bexon also made this presentation, and said he was sorry to lose Mr. Sinclair's services. Mr. Sinclair has been in the Kilmarnock offices for the past five and a-half years.

Tramway Officials.—The L.C.C. Highways Committee recommends the following annual revisions of tramways department staff:—MR. J. TERRY, district traffic superintendent, increase from £325 to £350 a year; MR. R. E. FARBRIDGE, assistant accountant, increase from £325 to £350 a year; the salary (£140) of MR. T. R. IERLAND, assistant in Section (*a*) of the fourth class in the tramways department, is to be increased to £150 a year. Special duty pay is to be granted to MR. H. VORLEY, accountant (£52 10s.), and MR. H. HOLLAND, assistant in the first class (£10).

General.—MR. STAFFORD SINCLAIR has relinquished the Scottish representation and management of Messrs. Ward & Goldstone, and for the present all correspondence should be addressed care of the Ideal Electrical Co., 26, Alexandra Park Street, Glasgow. He will shortly take up the representation of a well-known manufacturer, and will be back at 50, Wellington Street, Glasgow.

On February 20th, a dinner was given to MR. WALTER FINLAY, W.S., by the electrical trade of the City of Edinburgh. Mr. Alex. Pratt, vice-president of the Electrical Contractors' Association of Scotland, was in the chair. Presidents of several allied trade associations were present. The toasts included "The Corporation of the City of Edinburgh," proposed by Mr. Basil A. Pilkington, and responded to by Councillor F. J. Robertson; "Our Guest," proposed by Mr. Geo. Wishart, and, of course, replied to by Mr. Finlay; "The Electrical Trade," proposed by Mr. R. K. Hill, and replied to by Mr. Thomas Wright; "Kindred Associations," proposed by Mr. J. Plunkett and responded to by Mr. Peter Dick; and "The Chairman," moved by Mr. R. Graham. About 50 gentlemen were present, and during the evening a presentation was made to Mr. Finlay in recognition of his services to the Association. In the course of some of the speeches, a hope was expressed that there was a good time coming, when the Edinburgh Corporation would help rather than hinder the efforts of local firms.

MR. C. H. GASSON has recently left the firm of Messrs. Siemens Bros. Dynamo Works, Ltd., Dalston, and is now representing the Imperial Lighting Co.

NEW COMPANIES REGISTERED.

International Telephone Co., Ltd. (127,301).—Registered February 20th, by W. E. Hart, 3, Mincing Lane, E.C. Capital £100, in £1 shares. Objects: To acquire in any part of the world any concessions, grants, decrees, rights, powers, and privileges, for the construction and working of a telephone system or systems, to establish, control and regulate telephones and works for the supply of electric light, heat and motive power, to transmit and facilitate the transmission of telephonic and telegraphic communications and messages, &c., provided that no telephonic or telegraphic business within the exclusive privilege conferred upon the Postmaster-General by the Telephone Acts shall be carried on in the United Kingdom without his previous licence or consent. The signatories (with one share each) are:—A. H. Harris, 58, Brookville Road, Walham Green, S.W., clerk; J. A. Hewitt, 180, Trundleys Road, Deptford, S.E., clerk; A. E. Hurdle, 32, Cremorne Road, Cheyne Walk, S.W., clerk; A. Morison, 21, Duckett Road, Harringay, N., clerk; R. J. Cocks, 37, Lilleshall Road, Clapham, S.W., clerk; H. Foyle, 21, Selhurst Road, South Norwood, S.E., cashier; H. E. West, 19, Kay Road, Stockwell, S.W., clerk. Registered without articles of association. The first directors are G. Franklin and J. E. Kingsbury.

Scott's Starter Syndicate, Ltd. (127,256).—This company was registered on February 18th, with a capital of £5,070 in £1 shares (5,000 preference) to acquire the benefit of certain existing inventions, and to adopt agreements (1) with Laurence, Scott & Co., Ltd., and Wm. H. Scott and (2) with Laurence, Scott & Co., Ltd., relating to the manufacture of electric starters. The subscribers (with one preference share each) are:—W. H. Scott, Oaklands, Thorpe St. Andrews, Norfolk, engineer; G. N. Cornwallis Mann, Roselands, Albemarle Road, Norwich, engineer; F. W. Doggett, Hill House, Hethersett, Norfolk, engineer. Private company. The number of directors is not to be less than two or more than five; the first are Wm. H. Scott, G. N. Cornwallis Mann, F. W. Doggett and S. Cozens-Hardy; Laurence, Scott & Co., Ltd., may, while holding 50 shares, appoint a director in place of S. Cozens-Hardy; qualification, 50 shares. Registered office, Gothic Works, Thorpe, Norwich.

Kine Appliances and Repairs, Ltd. (127,323).—This company was registered on February 21st, with a capital of £1,000 in £1 shares to carry on the business of manufacturers of and dealers in photographic, cinematographic projection and scientific apparatus and requisites, electric lamps, &c. The subscribers (with one share each) are:—B. S. Dunning, 45, St. George's Square, S.W., gentleman; A. B. Allen, 20, Endell Street, W.C., instrument maker. Private company. The number of directors is not to be less than two or more than three; the first are B. S. Dunning, A. B. Allen and W. Smith (all permanent); qualification, £10. Registered by F. B. Smith, 17, Surrey Street, W.C.

Cremer Lamp and Engineering Co., Ltd. (127,273).—This company was registered on February 19th, with a capital of £2,000 in £5 shares, to carry on the business indicated by the title. The subscribers (with one share each) are:—R. Cremer, Highfield, Moortown, Leeds, mining engineer; J. M. Servaes, 19, Rumford Place, Liverpool, merchant; R. L. P. Bell, 79, St. George's Place, Glasgow, iron the steel merchant. Private company. The number of directors is not to be less than two or more than five; the first are R. Cremer, J. M. Servaes and R. L. P. Bell. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

Lux Lamp and Engineering Co., of Glasgow, Ltd. (8,543).—This company was registered in Edinburgh on February 14th, with a capital of £2,000 in £1 shares, to carry on in Glasgow the business of lighting and heating engineers. The subscribers (with one share each) are:—A. H. Schow, 27, Renfrew Street, Glasgow, merchant; J. H. Broadfoot, 27, Renfrew Street, Glasgow, engineer. Private company. The number of directors is not to be less than three or more than seven; the first are A. H. Schow and J. R. Broadfoot. Registered office, 27, Renfrew Street, Glasgow.

De Coster & Co., Ltd. (127,343).—This company was registered on February 22nd, with a capital of £600 in £1 shares (200 preference), to carry on the business of electrical, gas, hot water and general engineers, smiths and machinists, makers and patentees of and dealers in electrical, gas and hot water machines and appliances, &c. The subscribers (with one share each) are:—J. F. de Coster, 8, Elm Grove, Cricklewood, N.W., electrical engineer; Louisa A. de Coster, 120, Boundary Road, St. John's Wood, N.W., draper; C. de Coster, 951, Fulham Road, S.W., draper. Private company. The number of directors is not to be less than two or more than three; the first are J. F. de Coster and C. de Coster; qualification, one share. Registered by Scott-Lawson & Palmer, 22, Essex Street, Strand, W.C.

Smith Electrical Co., Ltd. (127,353).—This company was registered on February 22nd, with a capital of £1,000 in £1 shares, to carry on the business of electrical, mechanical and general engineers and merchants, cable makers and contractors, &c. The subscribers (with one share each) are: J. H. Smith, 10, Rose Mount Terrace, Keighley, electrician; F. W. Dewhirst, The Limes, Keighley, solicitor. Private company. Table "A" mainly applies. Registered office, 7, Cavendish Street, Keighley.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Westinghouse Cooper-Hewitt Co., Ltd. (89,947).—Capital £80,000 in £1 shares. Return dated December 10th, 1912. 10,000 shares taken up. 6s. per share called up. £2,500 paid. Mortgages and charges: Nil.

Pontelec Welding Patents, Ltd. (107,735).—Capital, £30,000, in £1 shares (20,000 ord. and 10,000 pref). Return dated January 13th, 1913. 20,000 ord. and 5,000 pref. shares taken up. £5,000 paid on the pref. £20,000 considered as paid on the ord. Mortgages and charges: £1,800.

Salerno Syndicate, Ltd. (111,301).—Capital, £8,300, in 4,000 first series "A" and 4,000 second series "A" shares of £1 each, and 6,000 "B" shares of 1s. each. Return dated January 15th, 1913 (filed January 23rd). 1,430 first series "A" and 6,000 "B" shares taken up. £1 per share called up on 1,430 first series "A," 1s. per share on 540 "B," and 6d. per share on 5,460 "B." Mortgages and charges: Nil.

Traffic Indicators, Ltd. (107,237).—Return dated January 14th, 1913. Capital, £7,500 in £1 shares, 4,750 shares taken up, £500 paid, £4,250 considered as paid. Mortgages and charges: Nil.

Corona Lamp Works, Ltd.—Issue on February 5th, 1913, of £4,050 debentures, part of a series of which particulars have already been filed.

Foster Engineering Co., Ltd.—Issue on February 14th, 1913, of £2,000 debentures, part of a series of which particulars have already been filed.

X.L. Electric Co., Ltd.—Debentures dated February 8th, 1913, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Capt. C. Wiener, Ewell Castle, Ewell, Surrey.

Insulators, Ltd.—Particulars of £300 debentures, created by resolutions of December 6th, 1912, and February 3rd, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's property, present and future, including uncalled capital. No trustees.

Electrical Distribution of Yorkshire, Ltd.—Mortgage on company's undertakings, authorised by Provisional Orders granted under Electric Lighting Act 1882 to 1909, and its other assets, including uncalled capital, dated February 17th, 1913, to secure all moneys due or to become due from the company to Barclay & Co., Ltd., 54, Lombard Street, E.C., not exceeding £5,000.

CITY NOTES.

Mansfield and District Tramways, Ltd.

Mr. A. R. Holland presided on 17th inst. at the meeting held at Mansfield. The directors, he said, had recommended an increase of 1 per cent. in the dividend, making 5 per cent. in all. Last year could not be fairly considered a normal year, for in the early part they were face to face with terrible labour troubles, and the disastrous coal strike must have affected to a great extent many of the people who would otherwise have patronised the tramways. In spite of this the company had not only held their own, but had done a little better. According to their manager's calculation, the coal strike had, however, lost the company in net profit certainly £1,000. A tramway service must be kept running whether the receipts went up or down. The traffic receipts during the year showed the slight increase of £640, which would doubtless have been much larger but for the strike. They had spent £2,393 on repairs and maintenance, and the depreciation account had been increased by £200, making £1,400 in all. The traffic expenses were slightly in excess of those of 1911, and power alone had cost £3,084. All sections of the system continued to show a fair development, and given freedom from serious labour troubles, coupled with the development of the great natural resources of the district, there was no reason whatever why the system should not continue to enjoy a steady measure of success. In 1912 the cars ran over 500,000 miles, and carried 3¾ million ordinary passengers and nearly 700,000 workpeople.

Mr. A. H. Beatty seconded the adoption of the report.

Westminster Electric Supply Corporation, Ltd.

Mr. J. Browne Martin presided on Wednesday at the offices, Eccleston Street, Belgravia, S.W., over the annual meeting of this company.

In moving the adoption of the report (see Elec. Rev., page 314), the Chairman said they would expect him to give them some idea of the work of the company and of the outlook for the next few years. They had a thoroughly sound and growing business, new lines were constantly opening out, and it was their aim to foster these in every way. For instance, the increase in the cost of petrol had turned some people's thoughts towards electric vehicles, and it was possible they might hear more of these before long. If so, they were ready to do their part. They were one of the earliest undertakings to realise that electric cooking was bound to supersede older methods. There were already a fair number of stoves in use, many others were proposed, and they were now making arrangements to hire out cooking ranges, and maintain them. But they did not confine themselves merely to encouraging new developments; they also supported the efforts which were being made to improve the older methods of utilising electricity. Their showroom had been open since May, 1910, and had been of great assistance to them in getting new business by giving consumers an opportunity of seeing for themselves the new apparatus which they wished to bring to their notice. They would see a system of lighting in that room, and downstairs in the showroom others might be inspected. In place of direct lighting, reflecting or semi-reflecting bowls were now being used which got rid of shadows and gave a much more pleasing effect for a small increase in cost. Heating by electricity was becoming better known, and was more used. There were new types of heating stoves which were more effective and pleasing than the older makes, and they might see the best of them in the showroom. Electric lifts were now considered almost as a necessity in large houses, and as regarded electric power, the gas and steam engines in their area were slowly but surely being supplanted by electricity. The old argument that "electricity is too expensive" had completely died out now that the metal lamp had been introduced, and he was sure they might be satisfied they were keeping abreast of the times and that they might anticipate continued and increased prosperity. They would see from the accounts that the receipts for the year showed an increase of £900 and the costs a decrease of £1,100. They were thus £2,000 to the good in their trading as compared with 1911. They should have done better had it not been for the coal strike a year ago, which cost them nearly £3,000, and for the subsequent rise in the price of coal, which amounted, on the average, over the various qualities they used, to about 15 per cent.

The Rt. Hon. W. Hayes Fisher, M.P., seconded the motion.

Mr. W. J. Fisher asked how the company stood with regard to the Special Committee appointed by the London County Council on the electric lighting undertakings. Had they been called on to give evidence, or was the Committee doing anything which the shareholders might advantageously know?

Mr. W. Hayes Fisher said the company had been asked to give evidence, and had done so; but the present London County Council came to an end on March 6th, and the Special Committee had reported, merely advising that it should be reappointed by the new Council to continue its deliberations, which must occupy a considerable period.

Mr. W. J. Fisher: At present they are only deliberating, and have not outlined any scheme?

Mr. Hayes Fisher: None whatever in their report.

The report was then adopted.

The Chairman, in reply to a question, said the coal situation was in a much happier position than it was a year ago. He could not say anything very definite about it, because these things varied from time to time, but they felt much more confident than they did a year ago.

Yorkshire Electric Power Co.—This company held its half-yearly meeting, on 18th inst., at Leeds. In referring to the report (see Electrical Review, page 229), the chairman (according to the *Financial News*), said that the expenditure during 1912 on capital account (£53,036) had been made principally in strengthening the system of the company and in providing generating plant to meet the increasing demands for current, rather than upon new mains in search of customers. In spite of this conservative policy there had been an increase of 25 per cent. in the sale of current, the revenue from which had risen from £34,269 in 1911 to £43,480 in 1912. Under ordinary conditions this would have resulted in a satisfactory margin of profit; but the coal strike of March last and the abnormal conditions under which their business had been carried on in the latter half of the year, owing to the large turbine being out of commission, had so raised the works costs as to absorb the profit which the directors should otherwise have hoped to put before the meeting.

Stock Exchange Notices.—Applications have been made to the Committee to appoint a special settling day in and to grant a quotation to:—

Mexico Tramways Co.—Further issue of $3,512,600 common stock, in shares of $100 each.

Tilling (Thomas), Ltd.—£200,000 5½ per cent. cumulative participating convertible income debenture stock.

Toronto Power Co., Ltd.—Scrip, fully and partly paid, for a further issue of £616,488 4½ per cent. consolidated guaranteed debenture stock.

And to allow the following securities to be quoted in the Official List:—

Adelaide Electric Supply Co., Ltd.—£25,000 additional 5 per cent. debenture stock.

Birmingham District Power and Traction Co., Ltd.—£51,453 additional 4½ per cent. first debenture stock.

Mirrlees Watson & Co., Ltd.—The *Times* reports that the directors announce a dividend of 10 per cent. and a bonus of 5 per cent., less tax—the same as a year ago.

Bristol Tramways and Carriage Co., Ltd.—Sir George White presided at the annual meeting, held at Bristol on 19th inst., and the report, as already published, was adopted.

Underground Electric Railways Co. of London, Ltd.

THE half-yearly meeting was held on Monday, at Westminster Palace Hotel, S.W., Sir Edgar Speyer, Bart., presiding.

The CHAIRMAN, in proposing the adoption of the report (see ELECTRICAL REVIEW, page 269), said it was again his pleasure to point to further considerable progress made during the half-year. The important events during that period—viz., the acquisition of a controlling interest in the Central London, and City and South London Railways, and the consolidation of the interests of the London United Tramways, Ltd., and the Metropolitan Electric Tramways Co., Ltd.—and the public statement he then made with regard to these developments, were of so recent a date that he had little to add to what he then said. All these schemes had since been satisfactorily carried through, and it remained now to develop and co-ordinate that great system of railways, tramways, and motor-'buses, which force of circumstances more than anything else had brought and welded together. He could only repeat and emphasise that in their opinion the only hope for the shareholders to get a return on their capital, and for the travelling public to get the best possible service, lay in the combination of these various transport agencies which ministered to the transit requirements of London. The fear had been expressed in some quarters that the concentration of the transport facilities of London would tend towards an increase in fares and a reduction in service. His reply to this suggestion was that a true safeguard against any possible abuse was to be found in the fact that the interests of the shareholders and the travelling public were identical. There was a second and not less important reason for their policy of concentration, and that was that large sums of money would be required from time to time for extensions and improvements to the system, and it was easier, and probably cheaper, to raise these amounts with the combined credit of all the companies than by individual effort alone; and this was all the more emphasised if it was borne in mind how poor the return on the capital invested in all the underground lines of London still was. The capital so invested amounted to the huge sum of nearly £60,000,000, on which the return to-day was 2¾ per cent. This was for the entire underground railways, including the Metropolitan and the Great Northern and City Railways, which did not belong to their system. If they took their own railways the result was practically the same. On the District it was only 2¾ per cent., on the London Electric 2¼ per cent., on the City and South London 2¾ per cent., on the Central London 3¼ per cent.—in the aggregate only 2·6 per cent. The yield on the cost of the company's holdings of London Electric ordinary shares which it had received for construction, and of those District second preference and ordinary stocks which it had received for electrification, was only 1½ per cent. and 1·55 per cent. respectively. The total capital of all the companies now identified with the company was £48,550,000, divided as follows:—Railways, £39,700,000; tramways, £5,700,000; omnibuses, £3,150,000. The total mileage was 520, made up of 60 miles of underground railways, 112 miles of tramways, and 348 miles of omnibus routes. For the year ending December 31st, 1912, the combined undertakings carried a total of 893,000,000 passengers, of which the railways carried 247,000,000, tramways 153,000,000, and the omnibuses 493,000,000. The combined properties employed a staff of nearly 25,000 men. Regarding the various companies comprised in the system, he could only refer them to the speeches of the respective chairmen which had been made at their recent shareholders' meetings. He could summarise the situation by saying that they showed continued progress and gave good hope for the future. The railways showed consistent improvement, and with the completion of the various extensions now under construction—namely, Paddington, Charing Cross and Queen's Park—this progress should be more marked in the future. With regard to the City and South London Railway, they could not hope for much better showings until the tunnels had been enlarged and the train service modernised. This would take at least two years after the necessary Parliamentary powers had been obtained. The Central London Railway was benefiting from its Liverpool Street extension, and when the Ealing extension was opened further increases in earnings should be shown. These factors, together with various economies which it was hoped could be effected, should substantially reduce the apparent deficiency upon the guaranteed stock. The fusion of the interests of the London United Tramways and Metropolitan Electric Tramways and the motor-'bus service, which would be run in conjunction with them, should prove a source of considerable profit to the London and Suburban Traction Co., Ltd., although the best results would not be obtained until the full number of new 'buses was running. The chairman of the London General Omnibus Co., in his speech, mentioned the considerable increase of the fleet and the inauguration of new routes, which it took some time to develop. It was, therefore, natural that the earnings per 'bus in the interim should show a decrease, for it took time for the new routes to become remunerative. But there was nothing discouraging in this. On the contrary, the business stood on a very sound basis. Reference was made in the report to the Parliamentary Bills which had been promoted by the various railways. The schemes embodied in these Bills, if sanctioned by Parliament, would greatly add to the travelling facilities of London. The City and South London Railway Co.'s Bill sought power to enlarge its tunnels to a diameter similar to that of the other tube railways. The scheme was of special importance, and involved engineering problems of considerable magnitude. The widening of the tunnels would enable the company to use rolling stock of modern design, and thereby greatly increase its capacity and efficiency. The London Electric Railway Co.'s Bill provided for a physical junction with the City and South London Railway at Euston, so as to give a through service of trains from the North to the South of London *viâ* the City. It also provided for a physical junction with the London and South-Western Railway at Hammersmith. This was for the purpose of running a through service of trains to Richmond. The Central London Railway Co.'s Bill provided for an extension from Shepherd's Bush to Gunnersbury. This extension would serve a thickly-populated district, and should improve the company's position. The District Railway Co.'s Bill provided for a widening of a section of the Putney line, which would considerably add to its facilities and assist in dealing with its rapidly growing traffic. Powers were also sought to enter into agreements with the Wimbledon and Sutton Railway. The Metropolitan Electric Tramways, Ltd., in which the company now had an interest through their holdings of the shares of the London Suburban Traction Co., was promoting a Bill to provide for railless traction on certain routes in the urban districts of Wood Green, Tottenham, and Walthamstow, for the purpose of connecting with the Walthamstow tramway system. A word of explanation regarding the Associated Equipment Co. might not be out of place. The share capital amounted to £500,000, all of which was owned by the company. As stated in the report, the company owned large works at Walthamstow. It also owned the Metropolitan Steam Omnibus Co., which was now running a fleet of 100 modern petrol 'buses. The works at Walthamstow were of modern design, and completely equipped for the manufacture of chassis, and also for certain repair parts required by the several companies, and all indications were that they would be fully occupied. The revenue from this company should prove a source of continuing profit to the company. The revenue accounts showed total receipts of £279,220, as against £156,549 for the corresponding half-year of 1911. The latter item, however, included £45,918 income from the operation of the power house then owned by the company. Deducting this item there remained an increase of £168,589, of which £154,540 was due to the income from the company's holdings in London General Omnibus ordinary shares and Associated Equipment Co. shares acquired in 1912. The net revenue, including a balance of £2,676 brought forward, but before providing interest on income bonds, was £198,480, a gain of £144,465 over the corresponding figure for 1911. This increase enabled the company to pay for the first time the full interest on the 6 per cent. income bonds of 1948, carrying forward a balance of £2,996. This compared with 2 per cent. per annum paid on the income bonds outstanding at December 31st, 1911. The total net revenue available for distribution amongst the income bondholders for the whole year of 1912 was £328,251, as compared with £93,511 in 1911, and the rate of interest paid on the income bonds in the two years was 5 per cent. and 1¾ per cent. respectively. He thought he was justified in congratulating the security holders on the fact that they were for the first time in their history paying the full interest upon the 6 per cent. income bonds. This had been accomplished notwithstanding the conservative financial policy pursued by the various enterprises under the company's control. They were all making full provision for depreciation and reserve, and were in a sound financial condition, and he need hardly add that they should not have paid the full rate unless they felt reasonably certain of maintaining this distribution. They had made very rapid strides in the last few years, and he did not think he was going too far if he expressed the hope that the shareholders would, before long, begin to receive some return on their capital after having patiently waited so long.

LORD GEORGE HAMILTON seconded the motion, and the report was adopted without discussion.

National Electric Supply Co., Ltd.—At the annual meeting held in Preston, last week, Mr. John Booth, chairman, in moving the adoption of the report, said there was a substantial increase in the profits, and the prospects were brighter than for several years past. Prices of coal had increased since the strike, and they were paying 40 per cent. more than a few years ago. Regarding taxes, they were the most highly rated electric lighting company in the kingdom. They appealed, and, after a long fight, agreed to a compromise, the result of which was a reduction of about 15 per cent. On the credit side they had about £500 more for lighting, and about £1,000 more for power, notwithstanding the increased use of the more economical metallic-filament lamps. The net result was a profit of £14,017, which was £1,243 more than last year. They were getting new consumers, and they now had more than made up for the loss of revenue caused by the metallic lamps. Dividends at 4 per cent. for the year on preference shares, and 4s. 6d. per share on the ordinary shares for the half-year, making 7s. 6d. per share for the year, also £1 7s. 2d. per share on the founders' shares, were declared.

The Bastian Meter Co., Ltd.—In their report for the year ending December 31st, 1912, the directors show a slight improvement in the trading results as compared with the previous year. The sum of £600 having been written off patents and goodwill, the net amount of profit for the past year as shown in the balance-sheet is £276, plus £587 brought forward, making £863. The directors recommend the payment of the 6 per cent. dividend on the cumulative preference shares, amounting to £121, and also a 4 per cent. dividend on the ordinary shares amounting to £397 for the year, absorbing £517, leaving £345 to be carried forward.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers during the five weeks ended January 31st, 1913, amounted to 1,021,662, compared with 857,647 units in the corresponding five weeks of 1912.

Charing Cross, West End and City Electricity Supply Co., Ltd.

The directors' report for 1912 first expresses regret at the death on the 18th inst. of Mr. H. C. Pulley, who joined the board as recently as 1910. The result of the year's working has been very satisfactory.

West End Undertakings.—The gross earnings of these undertakings from sales of current, rents, &c., were £146,676 in 1912, as compared with £140,922 in 1911; the expenses, excluding depreciation, were £66,686, as compared with £69,408; and the net earnings were £79,990, as compared with £71,514. After bringing in the balance of £15,949 from 1911, and £1,945 for interest accrued in 1912, paying interest on the debenture stock, and making £15,000 provision for depreciation as against £11,000 last year, there is a balance on net revenue account of £65,054, out of which have been paid the dividend for the year on the preference shares, amounting to £18,000, and an interim dividend for the first half-year at the rate of 5 per cent. per annum on the ordinary shares, amounting to £10,000, leaving a balance to be dealt with of £37,054. The directors recommend that a final dividend be paid on the ordinary shares for the second half-year at the rate of 5 per cent. per annum, making 5 per cent. for the whole year, absorbing £10,000; that there be carried to general reserve (income) account £9,054; carrying forward £18,000, as against £15,949 last year. The company has now connected to its West-end mains a total equivalent of 687,593 8 C.P. (30-watt) lamps. The total is made up as follows: 452,092 in lighting, 26,066 in heating, and 209,435 (8,406 H.P.) in motive power.

City Undertaking.—The gross earnings of this undertaking from sales of current, rents, &c., were £148,513 in 1912, as compared with £145,072 in 1911; the expenses were £84,959, as compared with £84,356; and the net earnings were £63,554, as compared with £60,716. After bringing in the balance of £36,158 from 1911, and paying interest on the debenture stock, loans and advances, there is shown a balance on net revenue account of £68,821, out of which has been paid the dividend on the preference shares amounting to £18,000, leaving £50,821, as compared with £36,158. The directors have transferred £32,821 to general reserve (income) account, and propose to carry forward £18,000. The company has now connected to its City mains the total equivalent of 651,488 8-C.P. (or 30-watt) lamps. The total includes 312,947 in lighting, 47,610 in heating, and 290,931 (11,701 H.P.) in motive power.

The chief engineer certifies that the plant and machinery at the several stations of the company have been maintained in a high state of efficiency.

The annual meeting is called for March 4th, at the offices.

	West End undertakings.	City undertaking.
Units generated	9,299,853	29,697,565
Units bought	9,380,304	1,827,715
Units sold—Public lamps	470,754	—
Other sales	13,587,716	—
Total	14,058,470	24,806,845
Used on works and transmission and distribution losses	4,621,687	6,718,435
Total accounted for	18,680,157	31,525,280
Public lamps	298	—
Total max. supply demanded, KW.	6,679	12,555

Bath Electric Tramways, Ltd.

The annual report for the year ended December 31st, 1912, states that the traffic and other receipts show an increase of £2,164. Owing to the coal strike, the great rise in the price of petrol, as well as the advance in price of all materials, the benefit of the additional traffic has been more than absorbed. The following are the earnings for the past five years:—1908, £38,395; 1909, £40,136; 1910, £42,372; 1911, £43,834; 1912, £45,998. The traffic receipts for the first six weeks of 1913 show an increase of £303, compared with those of 1912. During the year certain special repairs and alterations have been effected, principally in the improvement of the fleet of motor vehicles, while four new torpedo-type cars have been purchased and brought into service. The above expenditure amounted to £3,772, which has been reduced to £1,772 by the appropriation of the reserve for depreciation (£2,000), shown in last year's accounts, is not directly applicable to the year 1912, but has been charged against the accumulated revenue of previous years, thus providing for depreciation in a most effective form. The foundry acquired by the company, and referred to in former reports, has been improved by the addition of certain extra plants, and has given excellent results. After charging the expenses of operation and administration for the year ended December 31st, 1912, there remains a balance of £14,649, to which is added the amount brought forward after deducting £1,772 net expenditure referred to above £8,366, making a total of £23,015. From this is to be deducted interest on the 4½ per cent. first mortgage debenture stock paid and accrued to date, £5,973; fourth instalment of sinking fund for the first mortgage debentures, £1,000; interest on loans, £1,085; dividend on preference shares for the year to December 31st, 1912, paid July 1st, 1912, and January 1st, 1913, £3,750, a total of £11,809, leaving a net amount of £11,207. Of this there has been appropriated for contingencies and renewals account £8,000, leaving a balance of £3,207, which the directors recommend should be carried forward pending the completion of arrangements which are being made for meeting the loan standing in the balance-sheet of £21,150. No dividend is recommended for payment to the holders of ordinary shares, but the company is improving its position. The reserve account and the reserve for depreciation have been amalgamated into one fund, and it now stands at £10,000. By a sinking fund, £5,854 of the debentures has been purchased and cancelled, and, as indicated, a useful reserve fund has been built up with the surplus of past years.

Newcastle and District Electric Lighting Co., Ltd.

The annual meeting was held in Newcastle on February 21st.

Dr. J. B. Simpson, the chairman, in moving the adoption of the report (see Elec. Rev., page 316), said that at the last general meeting attention was drawn to the fact that the directors had under consideration the most advantageous method of making an issue of £150,000 second mortgage debentures, and it would be observed from the report that they had been offered to the public, and that practically the whole of the amount was taken up. That had enabled them to pay off the bank overdraft, certain temporary loans, &c. The reserve fund stood at £8,778, and the directors recommended that £2,000 be transferred to this account. On the other side of the accounts the increase under the heading of stores was represented by the increased stock of coals which experience showed to be necessary to carry in order to provide against strikes and labour troubles. He drew attention to one item in the profit and loss account under the heading of stores, fuel, water, &c. At the time of their last general meeting the coal miners' strike had been in existence nearly a month, and it was expected daily that an agreement with the men would be arrived at; when, however, the termination of the strike became very uncertain, the directors thought it wise—although events proved it unnecessary—to make arrangements for a further stock of coal in order to make quite sure of keeping their customers fully supplied with electrical energy, and that, of course, increased their expenses. The weekly half-holiday under the Shops Act had affected their revenue to some extent, but, notwithstanding this and the effect of these labour troubles on the profits of the company, the gross receipts had increased considerably. With regard to the agreement with the Newcastle Corporation to supply the electrical energy for the Newburn tramways, good progress was now being made with the laying of the lines, and they were informed that the first section would be opened to the public in May this year, so that some benefit would accrue during the latter half of the year.

Mr. Arthur Scholefield seconded the motion, which, as well as the dividend and re-election resolutions, was carried.

Launceston and District Electric Supply Co., Ltd.

The first annual meeting was held recently. Mr. R. B. Rogers, who presided, said that the report showed that the company had had a good start, there being 3,800 lamps connected, while fresh connections were being made. Since December 31st, 1912, the remainder of the issued shares had been taken up, the number now issued being 6,400. He paid a warm compliment to Mr. Willey, the resident engineer, and his assistants, and to Mr. W. Vosper, the secretary.

The report, which was adopted, showed that the company had paid its way from the first working year. A contract for a portion of the street lighting for a period of three years had been entered into. The directors had thought it necessary to purchase a second suction engine from Messrs. Crossley.

Lancashire United Tramways, Ltd.—The directors report, says the *Financier*, that the result of the working of this and the operating companies comprised in this company's system, worked out as though they were one combined undertaking, is as follows:—Traffic receipts, £71,465; miscellaneous receipts, £4,631; total, £76,096; less working expenses, £47,847; general charges (including direction, management, interest, &c.), £5,356; rent of leased lines, &c., £4,961, leaving £17,932; and dividend on holding in the New St. Helens and District Tramways Co., Ltd., £1,534; profit of combined undertaking, £19,466. The receipts, compared with those of the previous year, show an increase of £1,390, which includes an increase of £738 from the sale of electrical energy. The traffic earnings per car-mile amounted to 8·21d. The expenditure has increased by £1,109, largely due to the coal strike and the advance in the price of coal. The interest and dividends received by this company from the operating companies, together with sundry receipts, amount to £13,853. After deducting interest on the prior lien debenture stock and expenses, there remains the sum of £59, which has been carried to depreciation account. The undivided surplus of the operating companies, after payment of the interest and dividends before mentioned, is £6,905. The depreciation and renewal accounts and amounts carried forward in the combined companies amount to £16,429.

Scarboro' Electric Supply Co., Ltd.—The annual report of the directors, to be presented to the meeting on March 5th, states that during the past year there has been connected to the mains the equivalent of 4,142 (30-watt) lamps, making 116,329. The number of units supplied during the year, including the 300,000 minimum supply to the tramways, has been 939,120, an increase of 79,268, or over 9 per cent.; the number of consumers has also increased by 16 per cent. The accounts show that after placing £1,000 to depreciation account, there is a balance on revenue account of £3,402. The directors recommend that a dividend be paid, free of income-tax, at the rate of 3 per cent. for the year, which will absorb £3,000, leaving to be carried forward £402.

Para Electric Railways and Lighting Co., Ltd.

The directors' report for the year ended November 30th, 1912, shows that the revenue, after providing for all expenses in London and Para, was £133,038, plus £1,442 brought forward, and difference in exchange, and interest on deposits and transfer fees, £2,090, making a total of £136,570. Deducting interest and sinking fund on debenture stock, £38,500; and interim dividends paid on the preference and ordinary shares, £29,100, there remained £68,970. Out of this there is to be placed to depreciation and renewals reserve, £15,000, and to contingencies reserve, £15,000; final dividend on the 6 per cent. cumulative preference shares absorbs £9,600, and a final dividend of 5 per cent., less income-tax, on the ordinary shares for the half-year to November 30th, 1912 (making 10 per cent. for the year) requires £19,500, leaving to be carried forward, £9,870. A new D.C. unit of 600-KW. capacity, and a new large boiler, have been installed in the power station, displacing a smaller old unit and a smaller old boiler, of the value of £4,654, which amount has been charged against the renewals reserve and credited to construction capital account. Other minor improvements have also been carried out. A charge of £20,639 has been made against contingencies reserve, representing a balance of certain debts and charges, which have been settled during the current year. This reserve account has in the past been maintained at a high figure in view of the possibility of large reserve being required to offset these charges which have now been cleared up. The operating expenses have been considerably decreased during the year, the difficulties referred to in last year's report have been overcome, and the operating conditions generally are greatly improved.

Notting Hill Electric Lighting Co., Ltd.

Sir W. Crookes presided on Tuesday at Winchester House, E.C., over the annual meeting of this company.

The Chairman, in moving the adoption of the report (see Elec. Rev., page 316), said that they were still progressing satisfactorily, showing increasing profits year by year. The only money spent on capital account was for mains and meters, and this outlay was compulsory so long as they were able to obtain new customers, and they showed no sign of falling off at present. The total capital receipts amounted to £209,352, which was only about £40,000 less than the expenditure, the balance being provided by using the reserve fund in the business, instead of issuing new capital upon which dividends would have had to be paid. With regard to revenue account, it would be seen that the net profit increased from £23,557 to £24,436. The directors believed this to be a very satisfactory result, especially taking into consideration the increasing cost of fuel. Nearly the whole of the increase in the cost of producing the current was due to the higher price of coal, and, unfortunately, this rise in price was likely to be permanent. The credit side of the account was most satisfactory, and showed an increase of about £1,700, the total revenue being £44,780, against £43,059 in the year 1911. On the net revenue account, after allowing £3,000 for depreciation, and over £6,000 for interest on debentures, &c., a balance remained of £15,718 for division, against £14,486 the previous year. The balance of the depreciation, renewal and reserve fund account had now reached a total of £40,189, which they thought was sufficient to cover the depreciation to date on the plant, mains, &c., of the undertaking, kept as they were in an efficient condition out of revenue. Their contribution to the Kensington and Notting Hill joint debenture stock sinking fund now amounted to £14,302. As this fund was being invested at compound interest, it was increasing rapidly, and the total was over £52,000. The only item in the balance-sheet he need refer to was the deposit on the sale of property, £400. It appeared that their undertaking would never require to utilise some of the surplus property at present let on rental, and the directors accepted a satisfactory offer to purchase it. The amount appearing in the accounts was the deposit, and they expected that the sale would be completed shortly. The number of consumers had increased since last year from 3,513 to 3,771, representing the equivalent of an additional 12,000 8-C.P. lamps. The profit had steadily risen, and he believed would continue to do so in the future. Last year he mentioned that the directors had under consideration a scheme of co-partnership for the company's staff. The idea was heartily received by many shareholders, and during the year the directors had been able to bring it into operation. The scheme was very much appreciated by the staff, and the men showed a keenness in their work, and continued their loyal attitude to the company, which was a great advantage in case of any difficulties arising. As an example of the economies effected, he might mention that, although the total units sold increased by 145,565, the number of units used in transforming and distributing the current decreased by over 60,000. The scheme was fixed on such a basis that the bonus to the staff rose or fell according to the increase or decrease in the amount of profit available for distribution to the shareholders. The amount of bonus to be divided this year was £286, which would give the men an additional 8 per cent. on their wages. A man who got 30s. a week would receive £6 4s. After paying this bonus, there remained a balance of £7,297 for dividend on the ordinary shares, and the directors recommended the payment of a dividend of 5s. a share on the ordinary shares, which was a record in the history of the company. This would leave a balance of £928 to carry forward, being some £300 more than last year. Mention was made at last year's meeting that the London County Council had appointed a special committee to consider the question of the electric lighting of London, and they had been invited to give evidence, and would do their best to assist the committee in their deliberations. They still felt to a large extent the result of the introduction of the metal-filament lamp, but, happily, their continual increase in consumers had more than compensated for the lower consumption of current by these more economical lamps. There was no reason to take anything but an optimistic view of the future, and he looked forward to maintaining their steady rate of progress. The higher price of coal was almost bound to continue, owing to the increased cost of production since the strike, but he hoped the other materials they used would remain at their normal level.

Sir R. B. Martin seconded the motion.

Mr. Dawes expressed his pleasure at the amount of money the directors had been able to give to the men, and he considered the co-partnership arrangement was one of the happiest things they had ever done. He did not consider it was altogether an altruistic thing, because all connected with the company benefited from it as much as the employés, who would naturally take a greater interest in their work. He thought the shareholders must be satisfied with the position of the company.

The motion was carried.

Mr. Dawes next moved that the remuneration of the directors be increased from £1,100 to £1,500 per annum, and remarked that it was merely a tardy act of restitution on the part of the shareholders, because year after year in the past the directors had surrendered a large proportion of their fees. He gathered that the total amount they had surrendered up to 1907 was £5,249.

Mr. McMahon seconded the motion.

Mr. Bush suggested whether it would not be a better way to remunerate the directors by giving them their present remuneration and also a percentage on the profits above a certain sum.

This was not seconded, and accordingly the resolution of Mr. Dawes was carried.

The Chairman, in acknowledging the vote, said he thanked Mr. Bush for his suggestion, which the directors would consider, and, perhaps, at the next meeting, it might be brought up for discussion.

The meeting closed with a vote of thanks to the board and staff.

London Electric Supply Corporation, Ltd.

The directors' report for the year ended December, 1912, shows that the profit on working was £68,670, against £61,412 last year. Adding the amount brought forward, viz., £4,186, less interest on temporary loan and balance of expense of issue of debenture stock, viz., £2,380, makes a total of £70,477. From this there have been paid interest on debenture stock, £17,494; sinking fund for redemption of debenture stock in 1931, £12,000; leaving to be appropriated £40,983; dividend of 6 per cent. on the preference shares absorbs £26,952; a dividend of 2½ per cent. on the ordinary shares, £8,325; there is put to contingencies account £1,000, and £4,706 is carried forward. It will be noticed that the board has opened a new reserve fund in the form of a sinking fund account. £12,000 will be invested in this fund annually (the first payment being shown above), and the accumulation of these payments, with interest, together with the fund shown at the bottom of capital account, will be sufficient to redeem the whole of the existing debenture stock in 1931. The supply has been efficiently maintained during the year. The number of units sold amounted to 28,409,755 as against 20,476,982 last year; the total costs per unit sold being ·66d., as against ·82d. last year—a reduction of 20 per cent. The power supplied for traction purposes shows 75 per cent. increase, while the power supplied for industrial purposes shows 26 per cent. increase over last year. The plant and machinery have been maintained out of revenue and are in efficient condition. The L.B. and S.C. Railway have decided to electrify the whole of their suburban system. To meet the large demands which this will entail, the directors recommend the creation of £250,000 new capital, and a resolution to this effect will be proposed at the meeting. The death of the Earl of Crawford, K.T., is deplored by the board, and Viscount Duncannon has been elected in his place.

W. T. Henley's Telegraph Works Co., Ltd.—The directors' report shows a profit of £92,069 for the year 1912. From this are deducted directors' and auditors' fees, debenture interest, income-tax, and amount written off for depreciation on buildings and machinery, £23,986, leaving £68,083, to which have to be added the amount brought forward, £36,862, and the value of securities received in respect of the Bahamas-Florida Cable Repairing Fund, £4,041, making £108,987. The following are deducted: Transfer to reserve in respect of depreciation of Consols and other trustee securities £4,219, transfer to reserve account £15,000, bonus paid to shareholders in distribution of the Bahamas-Florida Cable Repairing Fund £4,000, dividend on preference shares £9,000, interim dividend on ordinary shares £10,000, leaving an available balance of £66,767, out of which the dividend on the ordinary shares of 15 per cent., free of income-tax (of which an interim dividend of 5 per cent. has already been paid) will require £20,000, income-tax on total ordinary dividend £1,750, leaving to be carried forward £45,017. Ordinary share dividend warrants are to be posted to-day.

Aberdeen Suburban Tramways Co.—The directors have been considering as to the extension of the company's business, either by the use of motor-buses or by cars run on the trackless trolley system. They hope before long to submit formal proposals to the shareholders with reference to the matter. For the half-year ended January 31st, 1913, the profit earned amounted to £1,404.

Paisley District Tramways Co.

Mr. O. H. Smith presided on February 20th at the offices, 83, Cannon Street, E.C., over the meeting of this company.

In moving the adoption of the report (see Electrical Review, p. 271), the Chairman said that the share capital stood as at June 30th last. The loan capital had been reduced by a further £800—making £2,300 to date—being the amount of debentures purchased during the half-year by the trustees for the sinking fund. General reserve account had been increased by £3,000 transferred from revenue and £653 for interest—an increase for the half-year of £3,653. The reserve created by the sinking funds stood at £6,237 as compared with £4,350—an increase for the half-year of £1,886, the debenture sinking fund being increased by £838 and the preference share sinking fund by £1,048. Sundry credit balances were £180 less than at June 30th. On the other side of the balance-sheet the capital expenditure had been increased by £1,700 during the half-year. This, with the expenditure in the first half of the year, was mainly expended on the four additional cars. Their investments in trustee securities stood at £12,950, and it was very gratifying to note that the market value of these securities at December 31st was above the cost price. The amount of £3,937 against the trustees for the sinking funds compared with £2,851 at June 30th. This item was, of course, increased each half-year by the contribution of £1,000 for the preference share sinking fund and by the accrued interest and dividends on the investment made by the trustees. Sundry debit balances were £323 in excess of the figure at June 30th. The traffic receipts for the half-year were £1,113 in excess of the receipts for the corresponding half-year of 1911. Unfortunately their expenses were very heavy, and the gross profit showed a reduction of £670. The additional services run during the half-year involved increased charges for electrical energy and for traffic wages, and the cost of maintaining the rolling stock was heavier than in the corresponding half-year of 1911. Local rates were also £250 in excess of the amount for the second half of 1911.

Mr. John Young seconded the motion, and the report was adopted without discussion.

Oxford Electric Co., Ltd.

For the year ended December, 1912, the revenue account shows a profit (including £1,145 brought forward) of £15,832. After providing £2,000 for debenture interest, and writing off £1,072 on account of hire-purchase installations, the balance available is £12,760, which the directors propose to appropriate as follows:—Dividend at the rate of 7 per cent. per annum, less income-tax, on the ordinary share capital (whereof 3 per cent. was paid in September), £7,000; dividend at the rate of 5 per cent. per annum on the preference share capital ranking therefor (whereof 2½ per cent. was paid in September) £2,414, to credit of reserve and renewal of plant account £2,500, leaving to be carried forward £846. Reserve and renewal of plant account has been charged with the cost of plant replaced. The lamp, heating and motive-power connections continue to increase satisfactorily. The plant has been maintained in thoroughly efficient order. The supply mains of the company have been extended in Hill Top, Cowley, and Charlbury Roads, also in Princes and St. Aldate's Streets. The directors record the death of Sir Irving Courtenay, and to the vacancy on the board, Prof. Thomas Lowndes Bullock, M.A., has been appointed. The annual meeting is called for Friday, March 7th.

Bruce Peebles & Co., Ltd.—The directors' report for the year ended December 31st, 1912, states that the results for the year are not as satisfactory as those for 1911. The profit from manufacturing, trading, &c., after appropriating £4,138 for maintenance, amounts to £3,865; but after deducting expenses of administration, the interest paid on the mortgage debentures and accrued on the unsecured debentures, there is an adverse balance of £4,594 for the year. The trading for the year has been seriously affected by labour strikes and consequent disorganisation of business. The prospects for the current year are better, owing to the recent improvement in prices and in the demand for the company's manufactures. All buildings, machinery and plant have been properly maintained during the year. Mr. C. H. M'Euen retired from the Board in December last, and Mr. Lee Murray who resigned the post of general manager at the end of the year, has been elected to fill the vacancy.

British Electric Transformer Co., Ltd.—The directors report that they consider the result of operations in 1912 satisfactory. The accounts show, after paying all manufacturing costs and expenses of administration, a net profit of £21,552, plus £3,162 brought forward. There is to be placed to reserve account £9,000. Preference dividend of 6 per cent. absorbs £2,597; a dividend of 10 per cent. on the ordinary shares requires £7,895, extra remuneration to the directors £1,106, and £4,117 is to be carried forward.

Erith's Engineering Co., Ltd.—The annual general meeting was held at 70, Gracechurch Street, E.C., on February 20th, when the directors' report was adopted, and the dividends for 1912, of 6 per cent. on the preference shares, and of 10 per cent. on the ordinary shares (as in previous years) were authorised.

South Metropolitan Electric Light and Power Co., Ltd.—The annual meeting was held on Wednesday. Our report will appear next week. Warrants for dividends payable to-day on the preference shares have been posted.

Waste Heat and Gas Electrical Generating Stations, Ltd.

The directors' report for the year ended January 31st, 1913, states that the profits earned, after deducting administration expenses, amount to £36,010 (£25,071 last year); less transferred to credit of reserve account, £9,000 (£7,500 last year); making £27,010 (£17,571). Adding the balance brought forward, £7,955, and deducting further remuneration voted to the directors at the last annual meeting £400, the profits available are £34,565, as compared with £23,619. The directors propose to declare a dividend at the rate of 8 per cent., absorbing £25,600, of which an interim dividend of 2½ per cent. was paid in August, 1912, amounting to £8,000. Last year the dividend was at the same rate. The balance to be carried forward is £8,965, as compared with £7,953. The balance of dividend is payable on March 15th, less income-tax. The total of the reserve account now amounts to £33,351, and the funds for the redemption of plant supplied under hire-purchase agreements amount to £2,493. The construction of the company's new generating stations at Port Clarence and Ayresome was finished during the course of the year, and the stations are now running satisfactorily and have added to the revenue; some retention moneys under the contracts for construction have yet to be paid to the contractors. The Bankfoot Power Co.'s new station at Bowden Close was put into operation in September, 1912, and is working satisfactorily. The new shares which the company subscribed in the Bankfoot Power Co., Ltd., have lately been called up to the extent of 10s. per share, making 12s. 6d. per share called up; the directors have also paid the balance of 7s. 6d. per share in advance at interest. The company suffered a considerable loss in revenue during the period of the coal miners' strike in the early part of the year, most of the stations being completely closed down for a period of some weeks. The company's plant has been maintained in thoroughly efficient repair by the electrical power companies in accordance with the terms under which the stations are operated. The directors have under consideration some proposals for the erection of further plant in the North-Eastern district for the utilisation of gas to be produced from coke-ovens.

London Electric Wire Co. and Smiths, Ltd.—The directors have declared a dividend of 7s. 6d. per share, less income-tax, on the ordinary shares for the half-year to December 31st, making 10 per cent. for the year, £40,000 being placed to reserve, making £70,000, £500 reserved against fall in market price of investments, and £20,793 carried forward.—*Financier.*

Continental.—Russia.—It is reported from St. Petersburg that the Société Russe d'Electricité Schuckert & Co. is about to increase its capital with the object of taking over the Russian business of the Siemens & Halske Co. The title of the company is to be altered to the Société Russe des Usines Siemens-Schuckert.

Australia.—The *Australian Mining Standard* states that the capital of the Electric Light and Power Supply Corporation, Ltd., Balmain, N.S.W., is to be increased by £50,000. This move was decided upon at a largely attended meeting of the shareholders held in Sydney. Reports submitted by the directors, general manager, and chief engineer showed the business of the company to be in a flourishing condition.

United Alkali Co., Ltd.—After paying the preference dividend, £50,000 is placed to the depreciation portion of the reserve fund and £31,000 is to be carried forward. There is no dividend on the ordinary shares, as compared with 4s. last year.

County of Durham Electrical Power Distribution Co., Ltd.—The directors have declared a dividend of 5 per cent. on the preference shares for the year ended December 31st.

County of London Electric Supply Co., Ltd.—The directors have declared a final dividend upon the preference shares at the rate of 6 per cent. per annum, less income-tax, and on the ordinary shares at the rate of 8 per cent. per annum, less income-tax, for the half-year to December 31st, making 6 per cent. for the year on the ordinary shares. £27,500 has been placed to reserve for depreciation.

Northern Light, Power and Coal Co., Ltd.—It is announced in the financial papers that certain bondholders in this company who are dissatisfied with the manner in which the company's affairs are conducted, have called a meeting for to-day at Salisbury House, E.C., to discuss the present position of the company and to consider proposals for united action.

South American Electric Light and Power Co.—According to the *Financial News*, after transferring £4,000 to depreciation account, writing £2,000 off preliminary expenses, and providing for the full dividends on the first and second preference shares, the accounts for 1912 show that the credit balance of £3,067 brought forward was increased to £5,471. This amount it is proposed to carry forward.

Tyneside Electrical Development Co., Ltd.—The directors' report states that the profit for the 12 months to January 31st amounted to £3,212, plus £1,989 brought forward The directors recommend a dividend of 15 per cent. for the year transferring to general reserve account £1,000 (making £6,000) leaving to be carried forward £2,601.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, February 26th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	per lb.	2¾d.	..
a „ Sulphuric	per cwt.	5/6	..
a Ammoniac Sal	„	42/-	..
a Ammonia, Muriate (large crystal)	per ton	£29 10	..
a Bleaching powder	„	£6 5	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£17 10	..
a Copper Sulphate	„	£23	..
a Lead, Nitrate	„	£29 10	..
a „ White Sugar	„	£27 10	..
a „ Peroxide	„	£32	..
e Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	8½d.	..
a Potash, Caustic (88/90 %)	per ton	£22 10	..
a „ Chlorate	per lb.	8½d.	..
a „ Perchlorate	„	4½d.	..
a Potassium, Cyanide (98/100 %) (for mining purposes only)	„	7½d.	..
a Shellac	per cwt.	85/-	12/6 inc.
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5	..
a Soda, Caustic (white 70/72 %)	„	£10 5	..
a „ Chlorate	per lb.	8½d.	..
a „ Crystals	per ton	£8 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£95	£2 inc.
b „ Wire, in ton lots	„	£112	..
b „ Sheet, in ton lots	„	£120	..
p Babbitt's metal ingots	„	£88 to £145	..
c Brass (rolled metal 2" to 12" basis)	per lb.	8¼d.	⅛d. dec.
c „ Tube (brazed)	„	10½d.	¼d. dec.
c „ „ (solid drawn)	„	9d.	¼d. dec.
c „ Wire, basis	„	8¾d.	⅛d. dec.
c Copper Tubes (brazed)	„	11½d.	¼d. dec.
c „ „ (solid drawn)	„	10¾d.	¼d. dec.
g „ Bars (best selected)	per ton	£81	£2 dec.
g „ Sheet	„	£81	£2 dec.
g „ Rod	„	£81	£2 dec.
d „ (Electrolytic) Bars	„	£69	£7 dec.
d „ „ Sheets	„	£86	£7 dec.
d „ „ Rods	„	£74	£7 dec.
d „ „ H.C. Wire	per lb.	9½d.	⅛d. dec.
f Ebonite Rod	„	5/8	..
f „ Sheet	„	4/9	..
n German Silver Wire	„	1/10	..
h Gutta-percha, fine	„	7/- to 8/-	..
h India-rubber, Para fine	„	4/8	8d. inc.
j Iron Pig (Cleveland warrants)	per ton	60/-	4/8 dec.
j „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Pig	„	£16 15 to £17	7/6 dec.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£7 15	6/6 inc.
c Mica (in original cases) small	per lb.	6d. to 8s.	..
c „ „ „ medium	„	8/6 to 6/-	..
c „ „ „ large	„	7/6 to 11/-	..
o Nickel, sheet, wire, &c.	„	3/6 to 4/6 nom.	..
p Phosphor Bronze, plain castings	„	1/2 to 1/3½	..
p „ „ rolled bars & rods	„	1/2	..
p „ „ rolled strip & sheet	„	1/2½	..
o Platinum	per oz.	185/-	..
d Silicium Bronze Wire	per lb.	11d.	¼d. dec.
Steel, Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£222 to £223	£4 dec.
n „ Wire, Nos. 1 to 16	per lb.	2/8	½d. dec.
p White Anti-friction Metals	per ton	£45 to £228	..
k Zinc, Sh't (Vieille Montagne bnd.)	„	£29 5	15/- dec.

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
j Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co

Electrical Irrigation Scheme.—An association has been formed at Tondern (Schleswig-Holstein), to handle a proposition to dam the Bredau estuary. The cost of the scheme is estimated at £68,500, towards which sum the State is to advance £16,200 and the province of Schleswig-Holstein £2,450, the remainder being subscribed by shareholders. It is proposed to build across the estuary a large steel sluice which will retain water required for irrigating purposes, and will enable surplus water to be discharged at ebb tide while preventing inundation of the surrounding low-lying land at flood tide. A pumping station is to be erected to control the water level in the irrigated area, and a central station is to be built to supply electrical energy to the pumps. The landowners in the neighbourhood are wealthy, and the scheme is so much to their advantage that no difficulty is anticipated in raising the £50,000 capital still required.—*Zeit. f. E. u. M.*

STOCKS AND SHARES.

Tuesday Evening.

Markets, as a whole, continue very unsettled, although part of the depression wore off on Monday upon the outlook for foreign politics becoming a little less gloomy. From the news which came in, it was thought that the war in the Balkans might march to a conclusion quicker than had been expected, since Turkey apparently is not eager to continue the struggle. However, the change was more in sentiment than in volume of business, and prices tended to recede after having been better at the opening of the week.

The managing director of one of the big trust companies told us the other day that his board had decided unanimously to cease all business in stocks and shares for at least a fortnight. However tempting might be the underwriting or other proposition put before them, these directors resolved to set their faces against it. The determination is typical, no doubt, of what is happening in many other quarters, individual as well as joint stock. So it is not surprising that prices should dwindle in the absence of support other than that adventitious aid which is afforded by the occasional climbing in of the bears.

New issues are very chary of putting in an appearance just now, and several which were promised for February still repose in the pigeon-holes of their promoters. In view of the chilly reception afforded to others which have been bolder—not to say more rash—the postponements are natural enough. Underwriters themselves are beginning to agree that discretion is by far the better part of valour.

The Home Railway market has been disturbed by the difficulties which have arisen between the Midland Railway Company and its employés over the case of the guard Richardson. The Midland Company, by the way, seems to be somewhat unfortunate in its relations with the staff. The incident had its effect upon prices in the market at large, and Districts fell 1½. Beyond this there is no particular change, except in the prices of the pre-ordinary descriptions, which have receded still further. City and South London 5 per cent. Preference stocks, after their quartet of falls of 2½ last week, have continued to slump. District 6 per cent. Debenture lost 4 points, and the First Preference 2. Metropolitan 3½ per cent. Debenture stock fell 1, and the 3½ per cent. Consolidated Preference stock shed 2. The same movement has been going on amongst all the gilt-edged stocks of the Home Railway department, and the best class Home Railway Debentures can be bought now at levels which pay the round 4 per cent. on the money; while in the cases of Preference issues, 4¼ to 4½ per cent. can be obtained, with nearly 5 per cent. on City and South London Preferences.

Underground Electric Railways shares are 5s. better after their sharp fall, and the 6 per cent. Income bonds regained their drop of 1½, the meeting on Monday being hopeful. London United Tramway Preference have been flat, falling 7s. 6d. to 4⅛; and declines have occurred in some of the British Electric Traction issues. Great Northern and City Preferred Ordinary is ⅛ lower.

Dividend declarations are having little effect upon prices in the English electricity supply market. St James', Charing Cross and London Preference all fell ⅛, while Cities lost the 10s., which they rose last week. The County of London declares its usual dividend of 8 per cent., making 6 per cent. for the year, with £27,500 to reserve for depreciation. There is no change in the price of the shares. South Londons are the turn better. In the manufacturing group there is little of interest to notice. Edison and Swan "A" shares (£3 paid) strengthened a trifle, there being a buyer in the market, and the price is nominally 1/16 up at 3/16 middle.

Affairs in Mexico seem to go from bad to worse, but the fall in the various utility securities has been arrested, and a rather better tone prevails in some of the bonds. Mexican Light and Power First Gold bonds have rallied 3 points, and the Tramways Company bonds are both better, Mexico Tramways Common being a point higher at 107½; while Mexican Electric Light 5 per cent. First Mortgage bonds are 3 points up after their severe fall, so that the pronounced flatness is being quietly wiped out. From the various scrappy items of news that come through with regard to the amount of damage done, it would appear that the soldiers have not done much hurt to private property up to the present, except in the case of some of the railways, upon which, if reports are to be believed, considerable destruction has been wrought in the way of blowing up bridges, and so on.

Other Traction issues are steady, with a fall of 5 in Kalgoorlie "B" Debenture, and one of ½ in Anglo-Argentine Tramways 4½ per cent. Debenture. Lisbon Fives are a point higher at 94½ middle. An informal meeting has been called for Friday in this week to discuss the position of the affairs in the Northern Light, Power and Coal Company. Having regard to the parlous state into which the market for the bonds has fallen, and to the fact that they are practically unsaleable at about 15, it is not surprising that steps should be taken to inquire into things generally. The London board was by no means anxious to encourage the meeting, on the ground that a formal meeting of the bondholders will be convened by the directors in the near future.

There is so little going on in the Telegraph market that its affairs can be dismissed in a few lines. The depression of other markets has caused a slight dulness amongst the leading issues, but the only noticeable changes are small falls in Eastern Extensions, West India and Panama, and West Coast of America shares. The Mackay issues are a little duller, and telephone descriptions, as a whole, tend to the lower side. National Telephone Deferred is almost a nominal market, and its quotation was removed from the Stock Exchange Official List on Tuesday, when the company's books closed finally. Marconis are a little easier at 4⅞ middle.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Feb. 25th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord.	10	5½	6†	9¼ — 10¼	..	5 4 9
Do. 4½ % Pref.	10	4½	4½	8¼ — 9½ xd	..	4 14 9
Do. Second 6 % Pref.	10	6	6	10¼ — 10¾ xd	..	5 17 1
Do. 4½ % Deb. Stock	Stock	4½	4½	96 — 98	..	4 11 10
Brompton & Kensington, Ord.	5	10	9†	5⅞ — 5⅞	..	5 6 8
Do. 7 % Cum. Pref.	5	7	7	8⅝ — 9	..	3 17 9
Central Electric Supply, 4 % Guar. Deb.	100	4	4	95 — 98	..	4 1 8
Charing Cross, West End & City	5	5	5†	4⅛ — 5	— ⅛	5 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝ xd	..	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4⅜	..	5 2 10
Do. Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Chelsea, Ord.	5	6	4†	4½ — 5½	..	4 15 3
Do. 4½ % Deb.	Stock	4½	4½	96 — 99	..	4 10 11
City of London, Ord.	10	8	6†	17 — 18½	— ½	4 6 6
Do. 6 % Cum. Pref.	10	6	6	12½ — 13½	..	4 9 0
Do. 5 % Deb.	Stock	5	5	116 —120	..	4 3 4
Do. 4½ % Second Deb.	100	4½	4½	100 —102	..	4 8 3
County of London, Ord.	10	6	4†	11¼ — 12	..	5 0 0
Do. 6 % Pref.	10	6	6	11⅝ — 12⅛	..	4 19 9
Do. 4½ % Deb.	Stock	4½	4½	104 —106	..	4 4 11
Do. 4½ % Second Deb.	Stock	4½	4½	98 —101	..	4 8 3
Edmundson's, Ord.	£3	Nil	..	1/16 — 1/8	..	Nil
Do. 6 % Cum. Pref.	6	Nil	3	4¼ — 4⅝	..	..
Do. 6% Non-Cum. Pref.	5	..	..	1⅜ — 1½	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	82 — 86	..	5 5 11
Folkestone	5	6	6	4⅝ — 5¼	..	5 17 1
Do. 5 % Cum. Pref.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % First Deb.	100	4½	4½	90 — 92	..	4 17 10
Hove	5	9	8†	7⅞ — 8	..	5 12 6
Kensington & Knightsbridge, Ord	5	9	8†	7⅞ — 8¼	..	5 9 1
Do. 4 % Deb.	Stock	4	4	90 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	76 — 80	..	5 12 6
London Electric, Ord.	3	2½	..	1⅛ — 2	..	3 15 0
Do. 6 % Pref.	5	6	6	4⅞ — 5¼	— ⅛	5 14 8
Do. 4 % First Mort. Deb.	Stock	4	4	89 — 92	..	4 7 0
Metropolitan	5	4	4†	3¾ — 4	..	5 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅜	..	4 17 4
Do. 4½ % First Mort. Deb.	Stock	4½	4½	97 —100	..	4 10 0
Do. 3½ % Mort. Deb.	Stock	3½	3½	84 — 86	..	4 1 5
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	98 —101	..	4 9 1
Newcastle-on-Tyne 5 % Pref., Non-Cum.	5	5	5	4⅜ — 4⅞	..	5 2 7
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99½ — 102½	..	4 17 7
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9⅞ — 10⅜	..	5 11 7
Oxford	5	7½	6†	6⅛ — 6⅜	..	5 9 6
St. James' and Pall Mall, Ord.	5	10	10†	9 — 9½	— ⅛	5 5 8
Do. 7 % Pref.	5	7	7	7 — 7½	..	4 13 4
Do. 3½ % Deb.	100	3½	3½	84 — 87	..	4 0 6
Smithfield Markets, Ord.	5	2	2	⅜ — 1½ xd	..	..
South London, Ord.	4	5	..	2⅜ — 8¼	..	6 3 1
Do. 5 % First Mort. Deb.	100	5	5	97 —100	..	5 0 0
South Metropolitan, 7 % Pref.	1	7	7	1⅜ — 1½	..	5 12 0
Do. 4½ % First Deb. Stock	100	4½	4½	96 — 99	..	4 11 3
Urban, Ord.	£3	Nil	..	⅛ — ¼	..	..
Do. 5 % Cum. Pref.	5	2	‡	2⅜ — 3¼	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	84½ — 87½	..	5 2 10
Westminster, Ord.	5	10	9†	8¾ — 9¼	..	5 8 1
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 5¼	..	4 5 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅛ — 5⅜	..	5 6 8
Calcutta, Ord.	5	8½	7†	6⅝ — 7⅛	..	5 19 4
Do. 5 % Pref.	5	5	5	4 13/16 — 5 1/16	..	5 4 16 5
Calgary Power, 1st Mort. Bds.	100	5	5	92 — 94	..	5 6 5
Canadian Gen. El. Com.	$100	7	7	115 —119	—1	5 17 8
Do. 7 % Pref.	$100	7	7	120 —124	..	5 13 0
Cordoba Lt., Power and T., Ord.	1	3	5	1⅜ — 1⅝	..	5 6 8
Do. 5 % Deb.	100	5	5	98 — 99	..	5 1 0
Elec. Lt. and P. of Cochabamba, 8 % Bonds	100	6	6	93 — 95	..	6 6 4
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	90 — 93	..	5 7 6
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	95½ — 97½	..	5 2 7
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/16 — 1/8	..	Nil
Do. 6 % Pref.	1	6	6	⅞ — 1	..	9 15 2
Kaministiquia Power, 5 % G. Bs.	$500	5	5	101¼ —103½	..	4 16 7
Madras, Ord.	£5	Nil	..	1⅜ — 1⅝	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	101 —104	..	4 16 2
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	82 — 86	+3	5 16 3
Mexican Lt. & Power, Common	$100	4	4†	77 — 81	..	4 18 9
Do. 7 % Cum. Pref.	$100	7	7	100 —105	..	6 13 4
Do. 5 % 1st Mort. Gold Bds.	..	5	5	92 — 96	+3	5 5 3
Monterey Ry. Light & Power, 5 % 1st Mort. Deb.	100	5	5	83½ — 85½	+ ½	5 17 0
Montreal, Lt., H. and Power	$100	8	9†	233 —238	..	3 15 8
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	10 — 20	..	..
River Plate, Ord.	Stock	10	..	217 —227	..	4 8 0
Do. 6 % Non-Cum. Pref.	Do.	6	6	104 —109	..	5 10 1
Do. 5 % Deb. Stock	Do.	5	5	100 —102	..	4 18 0
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 8
Shawinigan Water, Capital	$100	5	5	138 —142	..	3 10 5
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	106 —108	..	4 12 7
Do. 4½ % Per. Deb.	Stock	4½	4½	100½ —102½	..	4 7 10
Toronto Power, 4½ % Deb.	Do.	4½	4½	96½ —100½	..	4 9 7
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	91 — 94	..	5 6 5
Victoria Falls Power, Pref.	1	11½d.	17⅝d.	37/32 — 29/32	—1/32	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	106 —108	..	5 11 1

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4	4½†	7 — 7½	..	6 0 0
Do. 5 % Deb. Red.	Stock	5	5	97½ — 99½	..	5 0 6
American Telep. & Teleg., Cap.	$100	8	8†	134½ —136½	— ½	5 17 8
Do. Collat. Trust	$1000	4	4	91 — 93	..	4 6 0
Anglo-American Telegraph	Stock	3	3	66 — 68	..	4 8 3
Do. 6 % Pref.	Do.	6	6	110⅜ —111½	..	5 7 7
Do. Def.	80/-	..	24½ — 24⅝	— ⅛	6 1 10
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	7	8	7⅞ — 7⅞	..	5 1 7
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	79 — 81	..	4 18 9
Cuba Telegraph	10	6	6†	8⅞ — 9¼	..	6 9 9
Do. 10 % Pref.	10	10	10	16 — 17	..	5 17 8
Direct Spanish Telegraph, Ord.	5	4	4†	3¼ — 3⅜	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	6⅞ — 6⅞	..	7 8 2
Direct United States Cable	10	5	4	6⅝ — 7⅜	..	6 15 7
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99 —101	..	4 9 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	133 —136	..	5 3 0
Do. 3½ % Pref. Stock	Do.	3½	3½	78 — 80	..	4 7 6
Do. 4 % Mort. Deb.	Do.	4	4	96 — 98	..	4 1 8
Eastern Extension	10	7	7†	12⅞ — 13⅜	— ⅛	5 4 8
Do. 4 % Deb.	Stock	4	4	95½ — 97½	..	4 2 1
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	98 —101	..	3 19 3
Globe Telegraph and Trust	10	6	6†	10¾ — 11	..	5 9 1
Do. 6 % Pref.	10	6	6	12⅜ — 12⅞	..	4 13 2
Great Northern Telegraph	10	18	18	29 — 31	..	5 14 3
Indo-European Telegraph	25	13	5†	57 — 59	..	5 10 2
Mackay Companies Common	100	5	5	84 — 87	—1	5 14 11
Do. 4 % Cum. Pref.	$100	4	4	67 — 70	—1	5 14 4
Marconi's Wireless Telegraph	1	20	..	4⅝ — 4⅞	—1/16	4 10 1
Do. 7 % Cum. Partic. Pref.	1	17	..	6⅜ — 6⅝	— ⅛	4 7 9
Monte Video Telephone, Ord.	1	6	5†	1⅛ — 1 1/16	..	5 13 0
Do. 5 % Pref.	1	5	5	⅞ — 15/16	..	5 14 8
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	98⅜ — 99½	..	4 10 8
Oriental Telep. and Elec.	1	8	6†	1⅜ — 1⅝	..	4 11 5
Do. 6 % Cum. Pref.	1	6	6	1 29/32 — 1 31/32	..	4 18 6
Do. 4 % Red. Deb.	Stock	4	4	88 — 90	..	4 8 11
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	97½ — 99½	..	4 0 5
Reuter's	10	10	10†	11½ — 11⅝	..	8 10 2
Submarine Cables Trust	Cert.	6	6	127 —130	..	4 12 4
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	95 — 97	—1	4 12 9
United River Plate Telephone	5	8	..	7⅝ — 7⅞	— 1/16	5 5 10
Do. 5 % Cum. Pref.	5	5	5	5⅜ — 5⅝	..	4 8 11
West Coast of America	2½	2½	..	1¼ — 1⅜	— 1/16	4 8 4
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	95 — 98	..	4 1 9
West India and Panama Teleg.	10	2½	1¾†	3 — 3½	— ⅛	..
Do. 6 % Cum. 1st Pref.	10	6	6	10 — 10½	..	5 14 8
Do. 6 % Cum. 2nd Pref.	10	6	6	9½ — 10	..	6 0 0
Do. 5 % Debs.	100	5	5	101 —103	..	4 17 1
Western Telegraph, Ltd.	10	7	7†	18⅛ — 18⅝	..	5 2 9
Do. 4 % Deb.	Stock	4	4	95 — 97	..	4 2 6
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	97½ —100½	..	4 10 0

*Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. ‡ 8s. in Funded Dividend Certs.

CONTINUED ON NEXT PAGE.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for		Closing Quotations Feb. 25th.	Rise + or Fall —	Present Yield p.c.
	*	1911.	1912.			£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	—	..	Nil
Do. 5 % Pref.	1	5	5	—	..	6 8 1
Do. 4½ % Deb.	100	4½	4½	76 — 81	..	5 11 1
Brit. Elec. Trac., 6 % Pref.	100	..	..	10½ — 12½	..	..
Do. Do. Deferred	100	..	..	4½ — 6½	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	85½ — 88½	—1	6 15 7
Do. 7 % Non-Cum. Pr'f.	100	..	..	85½ — 88½	—1	..
Do. 5 % Perp. Deb.	100	5	5	91 — 95	..	5 5 3
Do. 4½ % 2nd Deb.	100	4½	4½	77 — 81	..	5 7 2
Central London Railway, Ord.	100	8	8	77 — 79	—1	8 15 11
Do. Pref.	100	4	4	82 — 84 xd	..	4 15 3
Do. Def.	100	2	2	77 — 79	..	2 10 8
Do. 4 % Deb.	100	4	4	98 —100	..	4 0 0
City & South London, Ord.	100	1⅞		..	..	..
Do. 5 % Pref., 1891	100	5	5	100 —103 xd	—1½	4 17 1
Do. Do. 1896	100	5	5	100 —103 xd	—1½	4 17 1
Do. Do. 1901	100	5	5	98 —101 xd	—3½	4 19 0
Do. Do. 1908	100	5	5	98 —101 xd	—3½	4 19 0
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
Dublin United Trams, 6 % Pref.	10	6	6	11⅜ — 12⅝ xd	..	4 18 0
Great Northern & City, Pr'f. Ord	10	Nil	Nil	2⅜ — 2⅝	— ⅛	Nil
Hastings Trams, 6 % Pref.	1	6	6†	—	..	7 7 8
Do. 4½ % Deb.	100	4½	4½	69 — 74	..	6 1 7
Isle of Thanet Trams, 5 % Pref.	5	2½	2½	2⅜ — 2⅝	..	4 15 3
Do. 4 % Deb.	100	4	4	75 — 80	..	5 0 0
Lancashire United, 5 % Deb.	100	5	5	78 — 80	..	6 5 0
London Elec. Railw'ys, 4 % Deb.	100	4	4	94 — 96	..	4 3 4
London United Trams, 5 % Pref.	10	Nil	..	4⅝ — 5	— ⅛	..
Do. 4 % Deb.	100	4	4	68 — 71	—1	5 12 8

NAME.	Stock or Share.	Dividends for		Closing Quotations Feb. 25th.	Rise + or Fall —	Present Yield p.c.
	*	1911.	1912.			£ s. d.
Metropolitan Railway Consol.	100	1⅞	1⅝	51¾ — 52½	..	3 2 2
Do. Surplus Lands	100	2⅛	2⅛	61 — 63	..	4 6 0
Do. 3½ % Deb.	100	3½	3½	84 — 86	—1	4 1 5
Do. 3½ % Pref.	100	3½	3½	82 — 84	..	4 3 4
Do. 3½ % Con. Pref.	100	3½	3½	81 — 83	—2	4 4 4
Metropolitan District Ord.	100	Nil	Nil	38½ — 39¾	—1½	Nil
Do. 6 % Deb.	100	6	6	135 —137	—4	4 7 7
Do. 4 % Deb.	100	4	4	93 — 95	..	4 2 6
Do. 4 % Prior Lien	100	4	4	98 —100	—1	3 19 8
Do. 4½ % First Pref.	100	4½	4½	85 — 87 xd	—2	5 1 2
Do. 3½ % Gtd.	100	3½	3½	75 — 77	..	4 10 11
Metropolitan Elec. Trams, Ord.	1	6	5†	—	..	5 18 6
Do. 5 % Pref.	1	5	5	—	..	5 14 3
Do. 4½ % Deb.	100	4½	4½	89 — 92	..	4 17 10
Do. 5 % Deb.	100	5	5	94 — 97	..	5 3 1
Potteries, Ord.	1	3½	..	—	..	..
Do. 5 % Pref.	1	5	5	—	..	6 19 0
Do. 4½ % Deb.	100	4½	4½	85 — 88	..	5 2 8
South Metro. Trams, 6 % Pref.	1	6	..	—	..	7 7 8
Do. 4 % Deb.	100	4	4	65 — 70	..	5 14 4
Underground Elec. Railways	10	..	..	—	+ ⅛	Nil
Do. "A"	1/-	..	..	—	..	..
Do. 6% First Cum. Inc. Deb.	100	..	6	111½ —113½	..	5 5 9
Do. 4½ % Bonds	100	4½	4½	95 — 96	..	4 10 0
Do. 6 % Income	100	1½	6 †	94½ — 95½	+1½	..
Yorkshire (West Riding), Ord.	5	Nil	..	—	..	Nil
Do. 6 % Pref.	5	3	3†	2⅜ — 3⅝	+ ⅛	4 12 4
Do. 4½ % Deb.	100	4½	4½	80 — 84	..	5 7 2

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4⅞ — 5⅛	..	5 7 4
Do. 2nd Pref.	5	5½	5½	4⅝ — 4¾	..	5 14 8
Do. 4 % Deb.	100	4	4	92½ — 94½	..	4 4 8
Do. 4½ % Deb.	100	4½	4½	98½ —100¾	— ½	4 9 7
Do. 5 % Deb.	100	5	5	98½ —100¾	..	4 19 6
Auckland Trams, 5 % Deb.	100	5	5	101 —103	..	4 17 1
Bombay Elec. S. & Trams, Pref.	10	6	6	11 — 12	..	5 0 0
Do. 4½ % Deb.	100	4½	4½	96 — 98	..	4 11 10
Do. 5 % 2nd Deb.	100	5	5	97 — 99	..	5 1 0
Brazilian Traction Light and Power	$100	..	6†	97 — 99	— ½	..
Brisbane Trams Invt., Ord.	5	8	8†	7⅛ — 7⅝	..	5 5 0
Do. 5 % Pref.	5	5	5	4⅝ — 5⅛	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	100 —103	..	4 7 5
B. Columbia Elec. Rly., Def.	100	8	..	139 —143	..	5 12 0
Do. Pref. Ord.	100	6	6	119 —123	..	4 17 7
Do. 5 % Pref.	100	5	5	105 —108	..	4 12 7
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 —103	..	4 7 5
Do. 4½ % Vancouver Deb.	100	4½	4½	101 —103	..	4 7 5
Do. 4½ % Con. Deb.	100	4½	4½	96⅜ — 98½	..	4 6 4
Calcutta Trams, Ord.	5	7	5†	5⅜ — 6⅛	..	5 12 0
Do. 5 % Pref.	5	5	5	4¹³⁄₁₆ — 5⅛	..	4 17 7
Do. 4½ % Deb.	100	4½	4½	97 —100	..	4 10 0
Cape Electric Trams	1	2½	..	—	..	..
City Buenos Aires Trams (1904)	5	5	5†	5⅛ — 5⅜	..	4 6 11
Do. 4 % Deb.	100	5	5	97 —100	..	5 0 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	93 — 97	..	5 8 1
Havana Elec. Rly., 5 % Bonds	$1000	5	5	99 —103	..	4 17 1
Kalgoorlie Elec. Trams	1	Nil	..	—	..	Nil
Do. 5 % A Deb.	100	5	5	88 — 88	..	5 18 8
Do. 6 % B Deb.	100	6	8	25 — 35	—5	..

La Plata Elec. Trms, Ord.	1	Nil	..	—	..	..
Do. Pref.	1	6	..	—	..	6 0 0
Lisbon Elec. Trams, Ord.	1	6	6†	1⅜ — 1⅝	..	4 7 3
Do. 6 % Pref.	1	6	6	1 — 1¼	..	4 16 0
Do. 5 % Deb.	100	5	5	92 — 97	+1	5 3 1
Madras Elec. Tr. (1904), Deb.	100	5	5	101 —103	..	4 17 1
Manaos Trams & Lt., 1st Deb.	100	5	5	87 — 90	..	5 11 1
Manila Elec. R. and Ltg., Bonds	$1000	5	5	98 —100 xd	..	5 0 0
Mexico Trams Com.	$100	7	7†	106 —109	+1	6 8 5
Do. Gen. Con. 5 % Bonds	..	5	5	92 — 95	+1	5 5 3
Do. 6 % Bonds	100	6	6	98 —101	+1	5 18 10
Para Elec. Rlys. & Lt., Ord.	5	10	10†	7⅜ — 7¾	..	6 7 0
Do. 6 % Pref.	5	6	6	4¾ — 5⅛	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	99 —101	..	4 19 0
Perth (W.A.) Elec. Tr., Ord.	1	5	5½	1⅜ — 1½	..	3 14 5
Do. 5 % 1st. Deb.	100	5	5	103 —108	..	4 12 7
Rangoon El. Tr. & Sup., Pref.	5	6	6	5⅜ — 5⅞	..	5 0 0
Do. 4½ % 1st Deb.	100	4½	4½	97 — 99	..	4 10 11
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	101 —103	..	4 17 1
Do. 5 % Mort. Bonds	100	5	5	96 — 98	..	5 2 0
Sao Paulo Tram, Lt. and P. 5 % 1st Deb.	$500	5	5	103½ —105½	..	4 14 9
Singapore Trams, 5 % Deb.	100	5	5	86 — 90	..	5 11 1
Southern El. Tr. B.A., 5 % Deb.	100	5	5	97 — 99	..	5 1 0
Un. Elec. Trams Monte Video	5	7	6†	5½ — 5⅝	..	6 1 9
Do. 6 % Pref.	5	6	6	4¾ — 5⅛	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	99 —102	..	4 18 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	100½ —103½	..	4 7 0

MANUFACTURING COMPANIES.

Aron, Ord.	1	5	..	—	..	8 0 0
Do. 6 % Pref.	1	6	6	—	..	7 2 2
Babcock & Wilcox	1	28	14†	—	..	4 0 0
Do. Pref.	1	6	6	1⅛ — 1¼	..	4 0 0
British Aluminium, Ord.	1	Nil	..	—	—	..
Do. 6 % Cum. Pref.	1	Nil	..	—	—	..
Do. 5 % Prior Lien Debs.	100	5	5	91 — 94	..	5 6 5
Do. Deb. Stk.	100	5	5	87 — 90	..	5 11 1
B.I. & Helsby Cables	5	10	8†	8⅛ — 8⅝	..	5 15 11
Do. Pref.	5	6	6	5⅞ — 6⅛	..	4 16 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	96⅛ — 98⅛	..	4 11 5
British Westinghouse, Pref.	8	Nil	Nil	—	..	Nil
Do. Deb.	100	4	4	58 — 62	..	6 11 2
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Brownett, Lindley, Ord.	1	..	..	2/- — 3/-	..	Nil
Do. Pref.	1	..	..	4/6 —5/-	..	Nil
Brush, 7 % Pref.	2	Nil	Nil	0 — ½	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	73 — 78	..	6 8 2
Do. 4½ % Deb	100	4½	4½	40 — 45	..	10 0 0
Do. 4½ % Second Deb.	100	4½	4½	28 — 32	..	14 1 4
Callender's Cable	5	15	10†	11 — 11½	..	6 7 8
Do. Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Castner-Kellner	1	20	20	31⅛ — 31⅜	..	5 5 0
Do. Deb.	100	4½	4½	103 —106	..	4 4 11

Crompton & Co.	8	Nil	..	—	..	Nil
Do. Deb.	100	5	5	55 — 57	..	9 15 6
Dick, Kerr	1	5	Nil	—	..	..
Do. Pref.	1	6	6	—	..	6 17 2
Do. Deb.	100	4½	4½	95 — 98	..	4 11 10
Edison & Swan, A, £8 paid	5	Nil	..	—	+ 1/16	Nil
Do. fully paid	5	Nil	..	—	..	Nil
Do. 4 % Deb.	100	4	4	61 — 65	..	6 3 1
Do. 5 % Second Deb.	100	5	5	72 — 75	..	6 13 4
Electric Construction	2	2½	3½	—	..	5 14 4
Do. Pref.	2	2	2	—	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	7⅞ — 8	..	8 5 8
Do. Deb.	100	5	5	92 — 94	..	6 4 2
General Electric, Pref.	10	5	5	9⅞ — 10⅜	..	..
Do. Deb.	100	4	4	90 — 95	..	4 4 8
Henley's, Ord.	5	17	5†	13 — 13⅜	..	6 8 8
Do. Pref.	5	4½	4½	4¾ — 5⅛	..	4 7 10
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
India-Rubber, G. & T.	10	..	7½	10 — 11	..	6 16 4
Do. Pref.	10	5	5	9¼ — 10¼	..	4 17
Telegraph Construction	12	17½	5†	86 — 88	..	5 16 8
Do. Deb.	100	4	4	95½ — 98½	..	4 1 9
Willans & Robinson	1	Nil	..	—	..	Nil
Do. Pref.	5	Nil	..	—	..	Nil
Do. Deb.	100	4	4	57 — 59	..	6 15 7

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 5 per cent., October 17th, 1912.

AUSTRALIAN TRAMWAY COMPANIES AND THEIR EMPLOYÉS.—XI.

(*Concluded from page 292.*)

Taking first the case of Adelaide. In Article IX (Vol. 72, page 194) it was stated that after the evidence as to the cost of living in the various cities of Australia had been taken that conferences between the parties might effect an agreement. When the Court met on December 6th, the Judge was informed that the Adelaide Trust had met the men. The suggestions, *re* "battlers," were not in their present form acceptable to the men and required consideration, but the Trust also demanded that the agreement should be made under Part 6 of the Act, making it a voluntary agreement. The Judge stated this was not allowable, as it must be under Sec. 24, to make it binding, and he would allow no other course, the case having come before him.

Mr. Goodman then argued that the dispute did not extend beyond one State, and consequently did not come within the scope of the Act, and proceeded to deal with various points in the Union's claims.

The Judge intimated on several of the points the form his award would take. While reserving all rights of the Trust, Mr. Goodman met the Judge wherever possible, accepting his decision that, provided the management were the sole judge of efficiency, promotion should go by efficiency, and in the event of equal efficiency, by seniority. Mr. Goodman objected to the claim that a non-employé should have access to the depôts to collect the men's Union subscriptions, and also to the claim for three minutes' waiting time at termini.

In conclusion, Mr. Goodman asked the Judge to take into consideration the financial position of the undertaking and the cost to the ratepayers which increases in the working expenses would entail, since it was not possible to increase the income by raising the fares. The Judge dissented from the view that these financial considerations should be allowed to influence him. These deficits were caused by payments to a sinking fund which was equivalent to a repayment of capital, and he did not consider that this ought to be done at the expense of the workers. He would take wages first and then consider their financial position.

The Adelaide award when published was in general similar to the Brisbane one already referred to. The schedule of wages are practically identical. Although they are an improvement in most cases on the rates at present paid, and to British readers seem very high, they fall considerably short of the men's request.

Take the principal cases—motormen and conductors. The men asked for 11s. per day; they are awarded, first year of service, 8s. 6d.; second, 9s.; third and subsequent years, 9s. 6d. Overhead wiremen, including linesmen.—The sum asked was 12s. per day; they were awarded 10s. Firemen in charge of less than four fires asked 12s., and were awarded 10s. Labourers asked 9s. per day and obtained 8s.

The Adelaide award principally differed from the Brisbane one in not demanding preference for members of the Union. Minor differences are a definite minimum of 27 minutes for motormen and conductors' meal relief and a definite minimum two minutes' wait at termini. The men asked for 30 minutes and a minimum wait of three minutes.

The Judge, in making the award, pointed out that the men's Union wanted higher rates than the 8s. 6d., 9s. and 9s. 6d. awarded to motormen and conductors, while the Trust urged him to award the conductors less, as they employed a large number of young men. As it was impossible for him to please both parties, he had kept the two rates equal, as he saw no sufficient ground for differentiation. He had also gone carefully into the question raised by the men that, owing to the high cost of rents and living in Adelaide, they should be awarded higher rates than in the eastern cities. This much was certain, that the cost of living had been increasing more or less steadily throughout the eastern States, and that in Adelaide rent called for at the present time a considerably larger proportion of a poor man's income than in Melbourne. But he could not find any justification for making a difference in a rate ruling for four or five years, in what might be a temporary variation.

With reference to the remaining cases, the Judge stated that he did not consider there was any real dispute in the case of the small horse-car undertaking at Coburg.

Melbourne and Perth had settled their differences by definite agreements, as already stated in these articles.

The remaining cases, namely, North Melbourne, Northcote, Ballarat and Bendigo, Hobart, Prahran-Malvern and Fremantle, gave considerable trouble. There were several conferences between the parties, at some of which the Judge was present, and eventually agreements were made in each case, though too late for binding signatures to be obtained before the close of the year.

In the case of North Melbourne, the motormen and conductors were to receive 8s. 6d. per day first year, 9s. second, and 9s. 6d. subsequent years. It differed from Melbourne in that it did not provide for annual leave, or extra pay on Sundays or extra time on holidays.

At Northcote a flat rate of 9s. 2d. per day was agreed on for gripmen and conductors; the working day to consist of eight hours, with overtime at the rate of time and a quarter for the first hour, and time and a half afterwards. Ordinary rates for Sunday work and no annual leave. For work on public holidays time and a quarter for first hour, and time and a half later.

The Hobart agreement follows Brisbane and Adelaide in granting 8s. 6d., 9s. and 9s. 6d. per day to motormen, and gives senior conductors 1s. per hour. Ten days' annual leave on nine days' pay, double rates for Sunday work, and overtime rates for public holidays.

At Ballarat and Bendigo the agreement was to take effect from December 1st, and continue till June 13th, 1916. The working hours were to be 104 per fortnight. The rates of pay to be:—Motormen, 1s. 1½d. per hour; conductors, over 21 years of age, 1s. per hour; under 21, 32s. 6d. per week for first six months, 36s. 10d. afterwards. At least 50 per cent. of the conductors were to be over 21 years of age. Casual motormen were to be guaranteed 45s. per week, or two-thirds of the statutory wage. Casual conductors to be guaranteed 42s. per week. Seven days' annual leave for six days' pay, and time and a quarter for Sunday work and public holidays. Time and a quarter for first hour's overtime, and time and a half afterwards.

At Fremantle and Prahran-Malvern there were differences, principally on small points; at Fremantle they were finally surmounted and the agreement was sealed, but at Prahran-Malvern the proposals were not accepted by the men. The Judge finally stated that he should make an award which would be suspended by a direct agreement between the parties if arrived at before January 1st. The general terms were comparable to those agreed on in the other cases.

The final proceedings in this long case consisted of the choice of the representatives of both companies and Union for the various Boards of Reference provided for in the awards and agreements. The Judge then stated that in the event of any of the agreements not being completed and filed by January 14th, awards based on the Melbourne Tramway Co.'s agreement would be made and come into operation. It remains to be seen whether this almost historic dispute which has demanded the close attention of the leaders and managers on both sides, withdrawing them from their proper work for so long a period, will result in peaceful and harmonious working between the two essential factors in tramway success, workers and employers.

The Constitution of Matter.—In the course of an address at a Science Exhibition which is being held at Surbiton, Sir J. Crichton-Browne referred to the recent researches of Sir Wm. Ramsay and others, and Sir J. J. Thomson, and pointed out that the view supported by the latter, that every atom consisted of an unchanging core combined with an outer shell which was subject to modifications, strongly reminded the biologist of the ultimate organic cell, which also possessed an inner core (the nucleus) and an outer shell. Similarly Sir J. J. Thomson had said that an atom was a part of an element which had a certain individuality, but was liable to modification by association with other atoms, a view which the lecturer compared with the unchangeable heredity of the living being, whose development, however, was capable of being modified by association with other living beings. He suggested that there might be great fundamental ideas such as these which were common to both the organic and the inorganic world, and which, studied in connection with design, would lift us above a shallow materialism and deepen in us a sense of reverence.

L.C.C. and Electrical Workers' Hours and Wages.—A Committee of the L.C.C. reported at Tuesday's meeting having given careful consideration to the representations of the Electrical Trades Union that the rates of wages and hours of labour paid by the Council to armature winders and magnet or coil winders should be increased from 9d. to 10½d. an hour, and from 7d. to 8½d. an hour, respectively. "The representations appeared more particularly to be directed to the rates paid at the central car repair depôt at Charlton, and the minimum asked for appeared to be based on the nature and quality of the work there performed. From inquiry made we are satisfied that the minimum rate at present recognised in London for armature winders is 9½d. an hour, and we recommend that this rate should be inserted in the Council's list. We have asked the Highways Committee to consider the representations of the Union that a rate higher than the minimum should be paid to the men employed at the central car repair depôt. We are not yet prepared to report as to the rate of wages of magnet and coil winders." It was recommended: "That the list of rates of wages and hours of labour be amended by increasing to 9½d. an hour the rate of wages of armature winders."

Miners' Safety Lamp.—On January 23rd, says the *Electrical World*, the American Museum of Safety, New York, awarded the Rathenau gold medal to Mr. T. A. Edison for his electric safety lamp. Two of his nickel-iron storage cells are used, in a nickelled steel case, which may be locked. The lamp is carried on the miner's cap, and is mounted in a fitting provided with a paratolic reflector and a thick glass lens; the miner cannot tamper with the lamp without breaking a mechanical seal. The connection between the lamp and the battery (which is attached to a waist-belt) is made by means of a twin-conductor flexible cord, provided with a plug terminal which, when pushed into a socket on the battery case, becomes locked and cannot be removed without unlocking the case. The battery weighs about 2 lb., and has an E.M.F. of 2·4 volts, and a capacity of 4 ampere-hours. The tungsten lamp gives 2 C.P.

WAGES AND HOLIDAYS IN CENTRAL STATIONS.

By JOSEPH S. AINSWORTH, A.M.I.E.E.

In recent years in many central stations a general feeling of dissatisfaction has existed over the very important question of wages paid. The success of recent strikes, and the frank admission of the Government that the cost of living has increased in greater proportion than the increase of wages, have tended to bring the various sections of a central station together, and led them to request for a consideration by the Electricity Committee of the altered conditions in the cost of living and the necessity of a general increase in payment of their employés.

Charge engineers have been grumbling over their ridiculous maximum of 35s. per week; switchboard attendants have been disheartened at their level 20s. per week; drivers and firemen have said that theirs was a non-living wage, and that for years they have had no Sunday off. In a few stations the different sections of the staff have discussed methods suggested by the Electricity Committee to improve conditions. In one or two stations the men have united and have affiliated with some powerful Trade Union. Some have, indeed, already obtained better treatment in both time and pay.

Leaving the other sections for a more convenient season, this article deals with that of charge engineers and switchboard attendants only, who, without having, like the men, recourse to applying pressure by votes, or the seductive persuasions of a threatened strike, which would throw the whole town into darkness, made use of personal and written applications for increases of salary and for the fixing of a sliding scale from a minimum to a maximum, with the view, which was quite legitimate, of knowing exactly what the prospects were in their station.

In a certain provincial central station, after several *individual* applications for an increase of salary had each been promptly acknowledged, but had not, however, proved successful, it was considered high time to take the next step and send in a *collective* application to the Electricity Committee, showing the much larger output of the generating station, its greatly increased capacity of plant, and the consequent larger number of duties. The result was as unexpected as it was curious. One of the applicants received an increase of 5s. per week, while a new arrival, who, by the way, was more experienced than a few of his predecessors, was taken on to fill a vacant position with 5s. per week less!

Another method of procedure had to be adopted. It was argued that if it could be proved that in other central stations of similar capacity and output better conditions prevailed, then a clear case would have been made out for better treatment. The chief was interviewed, and in a few days reported that the Committee would like to be shown that a better state of matters existed elsewhere.

Accordingly, a covering letter was sent to some 58 electricity works; answers to the following questions were asked for, and a definite reason was given:—

(*a*) *Charge Engineers:* (1) Number employed; (2) Minimum salary; (3) Maximum salary; (4) Average hours per week; (5) Sunday arrangements; (6) Holiday arrangements; and (7) Emergency arrangements.

(*b*) *Switchboard attendants:* The same seven questions.

About 47 replies arrived in time to be of use. In every case a stamped addressed envelope had been enclosed. In many of the replies a request was made for a copy of the tabulated results. As there is no central station but takes in at least two or three copies of the Electrical Review, it is certain that this contribution will furnish more than interesting reading. It is a pity those stations that asked for a copy of the tables accompanying this short article forgot to enclose a stamped addressed envelope, as had been done when they had been written to. However, we now thank them all for the valuable information placed at our disposal for the betterment of central-station charge engineers and switchboard attendants.

It is to be regretted that several of the questions drew blanks, as can be seen by the many question-marks in the tables. No answer at all is the only reply to be expected when no maximum salary has been fixed. How about Sundays or emergency arrangements? In most stations week-ends and holidays are arranged amongst the engineers. It would have been interesting to know if it was one Sunday off in three, or in two, or two in three, while a reply of 14 days may mean just 14 shifts.

A couple of stations pay overtime to their engineers on Bank Holidays and on Sundays.

With reference to "emergency arrangements" for charge engineers, information was required to determine *who* took shift when a charge engineer, on very short notice, wanted to have a shift or more off, as occasionally happened through some accident, or when a wedding or funeral had to be attended. Who took shift during, say, the six weeks that the three charge engineers were away on their 14 days' spell each? From both tables it is clear that this brief question was not at all understood, for out of the 47 central stations, only 22 have replied. In 14 out of the 22 stations the charge engineer is relieved by a switchboard attendant, improver, relief engineer, junior charge engineer, or apprentice. In only two cases does a general engineering assistant do relief work. In four stations the chief assistant or station superintendent acts as relief charge engineer. In one station "longer hours" are worked in cases of emergency; but how about during the precious seven days' holidays? One station sagely replies, a "sub" is found!

Eliminating the last two stations owing to their unsatisfactory answers, and omitting the two stations where a general engineering assistant takes charge, we have in 14 out of the 18 stations a junior acting for a senior during an emergency, or while the holidays are on. In only four cases does a chief assistant or station superintendent act in a subordinate capacity—quite possible for a couple of hours, but absolutely unworkable during the fortnight off of each engineer.

A chief assistant's time is more valuable to the well-being of the plant than a charge engineer's, and hence continued relief duty should be undertaken by a junior, *provided* all these are men capable of performing duties more responsible than those of the positions they occupy, a standard which is gradually being arrived at, though occasionally even now an alderman or a councillor, divesting himself of self-respect and manliness, hinders progress by worming in some inexperienced individual.

While the covering letter clearly implied that the procedure in ascertaining the information had had the previous approval of the Electricity Committee and the chief engineer, besides being signed by a responsible engineer, it appeared somewhat in the nature of a waste of time to reply and explain in the case where a chief wrote that the information could only be furnished to another chief. Fortunately for the profession, we had only two such communications.

Where some central stations go in for a low-salaried chief engineer, the strategical method of inaugurating a scale for his charge engineers, with a maximum and a minimum to accord with other stations of similar capacity and output, might, by *pay pressure* from below, produce a goodly scale for the chief himself, gifted with foresight.

But duties are by no means similar in central stations of similar capacity and output. The number of sets in use may be vastly different. One station may generate for lighting and power only, while another may have a combined lighting, power, and tramway traction load controlled from two distinct switchboards.

However much the difference in the amount of responsibility, it is clearly evident that some stations have badly paid staffs. If such stations can make use of these tables, and, encouraged by the success already achieved by one central station, send a covering letter to their chief and the Electricity Committee, a change for the better is bound to take place.

This procedure has been carried out with success by one of the 47 stations. "You have proved your case," said the chief to one of the representatives. A scale has been fixed, and a former level 35s. has become 50s. for charge engineers, while a previous 20s. has been converted into 27s. 6d. for switchboard attendants.

It should, however, be expected that a badly-paid staff on "proving their case," will not obtain a scale to accord with

the best paying station of similar size and output, but will obtain a scale to accord with the averages of the better payer and the cheap station. Half a loaf is better than none!

TABLE I.

No.	Station. Units sold.	Station. Plant capacity.	Charge engineers. No.	Pay. Min.	Pay. Max.	Hours.	Sundays.	Switchboard attendants. No.	Pay. Min.	Pay. Max.	Hours.	Sundays.	Holidays.	Emergency arrangements.
1	These stations have sold from one to two million units each for the last official year.	The capacity of over two-thirds of these stations ranges from 1,000 KW. to 2,000 KW.	3	30/-	35/-	53½	1 in 6	2	20/-	25/-	52	1 in 4	14 days	S.A. takes shift
2			3	45/-	55/-	56	1 in 3	3	21/-	22/-	48	off	14 days	?
3			2	55/-	?	53	2 in 3	2	32/6	40/-	53	2 in 3	14 days	?
4			2	30/-	45/-	56	2 in 3	2	20/-	30/-	56	?	?	?
5			2	40/-	50/-	56	1 in 3	1	25/-	32/6	56	1 in 3	14 days	S.A. takes shift
6			3	30/-	50/-	56	1 in 3	3	8/-	15/-	56	1 in 3	?	Apprentice takes shift
7			2	40/-	55/-	52	1 in 2	2	12/6	25/-	52	1 in 2	14 days	?
8			4	30/-	50/-	52	1 in 3	2	15/-	20/-	48	?	14 days	?
9			4	35/-	42/-	53½	1 in 3	3	10/-	15/-	53½	1 in 3	14 days	Junior C.E.
10			3	27/6	50/-	48	?	?	?	?	?	?	14 days	?
11			3	£120	£160	52	?	?	?	?	?	?	?	?
12			2	37/6	45/-	58	?	7	20/-	25/-	56	?	14 days	Chief assistant
13			1	65/-	?	48	?	3	30/-	40/-	56	?	?	?
14			5	30/-	50/-	53½	1 in 3	3	10/-	?	53½	1 in 3	14 days	?
15			2	35/-	45/-	61	?	2	10/-	14/-	?	?	14 days	Relief engineer
16			3	30/-	35/-	56	1 in 3	2	15	20/-	56	1 in 2	10 days	?
17			4	30/-	50/-	52	long wk.-end	2	15/-	20/-	48	2 hrs. on	14 days	?
18			4	25/-	37/6	54	1 in 2	2	15/-	20/-	51	1 in 2	14 days	?
19			2	35/	45/-	56	?	3	27/-	30/-	56	?	14 days	?
20			3	27/6	36/-	96	1 in 3	2	15/-	20/-	56	off	7 days	Spare man
21			3	40/-	50/-	56	1 in 3	1	25/-	?	?	?	14 days	General eng. assistant
22			3	35/-	45/-	56	1 in 3	4	5/-	15/-	50	2 in 3	14 days	?
23		None of these exceed 3,000 KW.	1	40/-	50/-	48	on 4 hours	4	22/6	40/-	53½	1 in 3	14 days	Improver
24			3	£80	£120	56	?	3	10/-	15/-	56	?	14 days	Senior improver
25			3	35/-	40/-	56	1 in 3	?	?	?	?	?	7 days	?
26	—	—	—	—	—	—	—	5	21/-	30/-	56	2 in 3	14 days	?
27	—	—	—	—	—	—	—	3	30/-	32/-	56	1 in 3	14 days	General assistant
28			3	£104	£130	56	1 in 6	3	28/-	35/-	55	1 in 6	14 shifts	?

TABLE II.

No.	Station. Units sold.	Station. Plant capacity	Charge engineers. No.	Pay. Min.	Pay. Max.	Hours	Sundays.	Switchboard attendants. No.	Pay. Min.	Pay. Max.	Hours.	Sundays.	Holidays.	Emergency arrangements.
1	Quite 15 of these stations have sold between *two* millions and *five* millions during the last official year.	The capacity of two-thirds of these stations ranges between 2,000 KW. and 4,000 KW.	4	£120	£150	48	1 in 4	4	30/-	42/-	48 sen. 56	1 in 4	?	Asst. shift engineer
2			—	—	—	—	—	3	21/-	40/-	jun. 60	?	14 days	?
3			3	40/-	55/-	55	1 in 3	7	10/-	30/-	56	1 in 3	14 days	?
4			5	35/-	42/6	56	time & half	7	5/-	25/-	56	time & half	7 days	Longer hours
5			3	40/-	50/-	53½	?	3	20/-	25/-	53½	?	?	?
6			3	40/-	60/-	56	?	2	20/-	30/-	52	1 in 2	14 days	Senior S.A.
7			3	35/-	?	56	?	4	22/6	?	56	?	14 days	?
8			3	35/-	55/-	50	1 in 3	2	25/-	30/-	50	1 in 2	14 days	?
9			3	40/-	60/-	56	1 in 3	3	30/-	35/-	56	1 in 3	?	S.A. takes shift
10			3	35/-	40/-	53½	1 in 3	3	26/-	30/-	53½	1 in 3	14 days	Stn. supt. takes shift
11			3	45/-	?	56	1 in 3	2	23/-	?	52	1 in 2	14 days	Sub. found
12			3	40/-	?	56	1 in 3	2	25/-	35/-	56	1 in 3	14 days	?
13			3	35/-	45/-	56	1 in 3	3	20/-	?	56	1 in 3	14 days	Stn. supt. takes shift
14			2	30/-	35/-	49	1 in 2	3	25/-	27/6	56	1 in 3	7 days	Chief asst. takes shift
15			3	45/-	50/-	48	?	1	35/-	?	48	?	14 days	?
16			4	40/-	60/-	48	?	1	48/-	?	48	?	14 days	Relief shift engineer
17			4	40/- 55/-	60/-	52½	1 in 3	7	15/- 8/-	27/6 12/-	54	1 in 3	16 days	?
18			3+2	35/-	37/6	53¾	1 in 3	3+3	25/-	27/6	50	1 in 2	14 days	Junior charge
19			4	£130	£200	52	1 in 2	3	38/-	40/-	56	1 in 3	21 days	Junior charge

RESULTS.

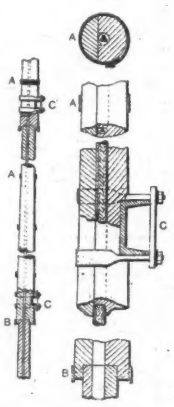
Number of central stations in Table	Charge engineers. Less.	3	More.	Hours. Less.	56	More.	Salary. Minimum. Less.	35/-	More.	Salary. Maximum. Less.	50/-	More.	Sundays. Less.	1 in 3.	More.	Holidays. Less.	14 days	More.
	9	12	5	12	12	2	11	5	10	12	9	3	2	12	4	3	21	None
II	1	11	6	11	7	None	1	6	11	5	2	8	1	9	2	2	12	2
	Switchboard attendants. Less.	3	More.	Hours. Less.	56	More.	Salary. Minimum. Less.	25/-	More.	Salary. Maximum. Less.	30/-	More.	Sundays. Less.	1 in 3	More.	Holidays. Less.	14 days	More.
	12	9	4	11	12	None	18	2	5	14	3	6	2	6	8	3	21	None
II	6	7	6	10	8	1	9	4	6	5	4	5	1	8	4	2	12	2

PROCEEDINGS OF INSTITUTIONS.

Cables for Shafts in Mines.

In opening the London meeting of the Association of Mining Electrical Engineers, held at the I.E.E. Building, Victoria Embankment, on February 7th, the chairman (Mr. W. C. Mountain) said that the Association had now 1,000 members, 11 home branches and one branch in Australia. Ten members were resident in Dover, which was destined to become a most important colliery centre. The London membership had doubled during the past year, and a number of consulting engineers in various parts of the country had joined the Association. The examination system adopted had proved a success; there were already 120 certificated members, and the next examination was to be held in March at the Northampton Institute. Mr. E. Kilburn Scott then read a paper on "Cables for Shafts in Mines."

Broadly speaking, the author recommends that high-tension aluminium cables should be used in mine shafts; that armouring should be dispensed with on shaft cables, a return path for current being provided by metal work already in the shaft or by steel ropes specially suspended to serve this purpose; that siliceous tire rubber be employed in place of steel to provide mechanical protection on cables exposed to moisture and hard wear; and that split telegraph poles be used in place of the sawn casing hitherto used when cables have been enclosed. Shaft cables cannot be handled by men or touched by animals in the ordinary way of working, and there is little danger of their mechanical injury, hence there is correspondingly little need for armouring as a mechanical protection. There is already, or there can cheaply be provided, sufficient continuous metal work in the shaft to act as a return path for current, hence armouring is unnecessary from this standpoint. A haulage rope, originally costing £50, may be worth only £5 when unfit for haulage, yet it will form as perfect an earth return, when suspended in the shaft, as a cable armouring costing several times as much as the original rope. In the shaft of the Frickley Colliery Co. (Doncaster), there is available about 30 sq. in. of continuous steel and iron, which could be used for return current purposes, and which has a conductance equal to that of 3 sq. in. of copper. The sectional area of the steel armouring actually used for return current, which cost about £160, is 2 sq. in., *i.e.*, about one-tenth the section of the wire ropes already in the shaft.



The revised rules require the armouring on mine cables to have a conductance 50 per cent. that of the conductors enclosed; in addition, the armouring must conform to the Engineering Standards Regulations. In H.T. cables there is no difficulty in complying with both sets of rules, but in L.T. cables the 50 per cent. rule calls for heavier armouring than the Engineering Standards Regulation. It is very desirable that there should be no joints in shaft cables, and other things being equal, it is easier to supply cables of great lengths without than with armouring.

Sector cores do not greatly reduce the over-all size of cables designed to operate above 3,000 volts. At 6,000 volts and higher pressures, sector core cables are more costly than, and are nearly as large as, circular core cables. The weight of the conductors is of great importance in shaft cables, and, in this respect, as also by its immunity from attack by bad water, aluminium offers considerable advantages over copper. For equal conductance, the ratio of weights of aluminium and copper cables is approximately as 1 : 2. Comparing three-core, medium voltage, paper-lead-steel-jute cables, those with aluminium cores are about 17 per cent. heavier than those with copper conductors, but the price of the aluminium cables is 5 per cent. less with round and 8 per cent. less with sector cores. From the point of view of supporting its own weight, aluminium is practically equivalent to steel; the maximum lengths of strand which can be suspended vertically are as follows:—

	Hard drawn.	*Annealed.*
Copper	15,500 ft.	5,950 ft.
Aluminium	25,000 ,,	13,600 ,,
Steel	20,700 ,,	14,750 ,,

Aluminium wires of No. 12 S.W.G. have been drawn in continuous lengths up to two miles for years past, and there is a ready market for scrap aluminium, though its relative value, as compared with new metal, is less than in the case of copper.

Aluminium is much more difficult to join than copper, but shaft cables are really main feeders, and are only tapped at the ends. Stranded aluminium cables are best jointed by the use of split sleeves, stepped so as to accommodate and clamp the several layers of each cable at the joint, the layers being cut back so as to permit of this.

The author believes that 11,000-volt shaft cables will soon be in general use, one important point in favour of such practice being the consequent reduction in the starting current to be supplied to induction motors. In reviewing the characteristics of various cable insulating materials, the author remarks that the elastic pitch compound used in bitumen cables softens at about 120° F., hence this insulation is not suitable for use on cables in upcast shafts. Rubber is at present largely displaced by paper and bitumen for power cables, but, as the supply and quality of plantation rubber improves, and possibly owing to the development of the synthetic production of rubber, the use of this material for heavy cable insulation will become more general. Silicious, or "cab-tire," rubber, has proved very successful as a mechanical sheathing for cables. Rubber insulation must necessarily be used in shaft sinking cables, and it appears reasonable to use a somewhat similar material for the protective coating. Bitumen sheathing is preferable to lead on paper-insulated shaft cables, owing to its lighter weight and the liability of stretching lead sheathing when suspending the cable in the shaft. "Indestructible" insulation consists of layers of paper with a cotton or jute braiding, the whole being impregnated with red lead and linseed oil; cables thus insulated resist chemical action and abnormal climatic conditions.

Coir yarn, made from the fibres of the coconut, is a likely substitute for jute. It is practically incompressible, very tough and less absorbent than jute, besides being cheaper. At present, coir plaiting is done by hand, and is uneven, but this objection could be overcome.

The methods at present employed to place shaft cables in position, are:—(1) Lower the cable from its drum by a winch at the shaft bank; (2) Suspend the drum in or under the cage, and pay out cable as the cage descends; (3) Lower the drum to the bottom of the shaft, fasten the cable end to the cage, and haul up; and (4) Run out the cable on the surface, attach one end to a locomotive, and lower the cable by moving the locomotive towards the shaft. The applicability of each method, and the precautions to be observed in its application, are considered in some detail in the original paper.

Better than the cone type of single suspension for armoured cables, is a suspension in which the armour wires are bent back at right angles on to the flange of the suspension sleeve, and clamped by a top plate and bolts. The elongation of the armouring determines the limiting weight that can be held by single suspension, long before the limiting breaking safety factor is reached. Clipping the cable to two steel ropes provides a suspension which is flexible, and offers less lodgment for dust and slime than cleats, but which introduces trouble in hot shafts by the high coefficient of expansion of the steel ropes as compared with the cable. An armoured cable fixed by cleats practically constitutes a solid bar down the shaft, and if the cleats be suspended from the tubbing by chains, the risk of injury by the impact of objects falling down the shaft is much reduced.

The objections usually urged against casing for shaft cables, are:—(1) The risk of damaging the cable when fixing capping, or by malleting where the troughing is out of alignment; (2) the difficulty of keeping out water at the lidding joints and between lengths; and (3) the cost of sawn timber, bolts and erection.

The author suggests that split telegraph poles be used for casing, as shown in the accompanying figure. The pole is sawn longitudinally in unequal parts, and the larger one is grooved. When the cable is in place the two parts of the pole are secured by steel "bracelets" A clipped over and driven down towards the butt of each length. The poles would be erected with the butts downwards, and the small end of each would be let into the butt of the length above it (B). By cutting "gains" in the poles, each could be simply and securely attached to the buntons by steel straps, as at C. Unarmoured aluminium cables could then be used with advantage, and excellent mechanical protection would be afforded by the casing.

In dealing with preservatives for timber, the author spoke at length of the Powell process; this will be specifically treated in these columns at an early date. In conclusion, the author considered the special requirements of sinking cables, and pointed out that tire rubber sheathing offers advantages over steel armouring, in respect of flexibility and imperviousness to water. The V.D.E. have issued special regulations for sinking cables, and these rules are reproduced in the original paper.

In opening the discussion, Mr. Nelson (Electrical Inspector of Mines) complimented the author on the exhaustive and practical nature of his paper, and endorsed the chairman's remarks as to the value of the Association and the discussions on its papers. The amount of electrical power used in mines had increased at least 100 per cent. since 1906, yet the latest reports showed the fatal accidents in mines to be fewer than in any year since 1906. This gratifying result was largely attributable to the direct and indirect influence of the Association. Mr. Nelson agreed that it was less necessary to armour shaft cables than cables in-bye, but, in his opinion, the ideal system would continuously armour all current-carrying parts, from the generator to the motors, with a sheathing strong enough to resist all destructive agencies which could be foreseen. The difficulty of repairing shaft cables was greater than that of repairing cables in-bye, and this probably accounted for the early practice of armouring shaft cables but not the in-bye cables. Too much importance was attached by the author to the strength of aluminium as regards supporting its own weight. Taking into account the lower tensile strength and conductivity of aluminium as compared with copper, the lighter metal did not appear to offer great advantages for shaft cables. The difficulty of making joints in aluminium conductors and the larger overall size of the latter for equal conductance were practical objections which became particularly serious in in-bye cables. There was no merit attached to the use of very large shaft cables; personally, he would always prefer two small cables to one equivalent larger cable. The larger the cable the stronger the armouring required, and this was secured by the revised rules, which required the conductance of the

armouring to be 50 per cent. that of the conductors enclosed, and which, in large L.T. cables, therefore required heavier armouring than was called for by the Engineering Standards Committee's Regulations. The revised rules were designed to indicate minimum precautions and factors of safety; in some cases it would be desirable to design more liberally than was required by the rules. The case in New South Wales, where armoured cables were destroyed by bad water in less than six months, afforded no argument against the use of armouring. It was presumably possible to protect the conductors from the water, and hence it would have been equally easy to protect the armouring. The German (V.D.E.), regulations quoted by the author called for armouring on shaft sinking cables, and with this rule Mr. Nelson was in complete agreement.

MR. LUPTON commented on the remarkable extension of the use of electricity in mines since 1884, when its applications were limited to signalling and shot firing. Electrical transmission had proved its advantages over compressed-air transmission in respect of economy and convenience, particularly in deep mines. The speaker was responsible for the sinking of two shafts in Yorkshire over 800 yd. in depth, and in such cases the question of the weight of the shaft cables was undoubtedly of great importance. In dry shafts there were possibilities in the use of bare lines. Most accidents in mines were due to conditions not foreseen; every mishap provided fresh experience and usually led to the evolution of means for preventing its repetition or reducing the seriousness of the consequences. The speaker pointed out that the "earthing" of mine circuits now consisted rather in the provision of a bare metallic return path at earth potential to the generator than in real earthing such as was practised in earlier days.

Other speakers offered the following information and opinions: The armoured *v.* unarmoured controversy was analogous to most others in that the supporters of both sides of the question were, to some extent, correct. Generally, armouring was advisable in mining work, but there were cases in which it possessed practical disadvantages. The limiting temperature (120° F.), suggested by the author for bitumen cables was a very conservative limit, but one which it was advisable to retain in designing colliery equipment since overloading was frequent. There was already a 1·00 sq. in. bitumen-insulated aluminium cable in use in a Durham shaft and bare aluminium lines laid in wood were being used for L.T. distribution in Cornish tin mines. The oxide film on aluminium formed readily in heat and moisture, so that the insulation of a L.T. aluminium line might increase under conditions that would destroy the insulation of a copper feeder. It was not easy to joint aluminium cables; a number of solders had been produced which would unite small wires and strips satisfactorily, but which were useless for jointing large stranded cables. In Messrs. Callender's installation in Brussels—not Ostend, as stated by the author—the cast joint described had proved the best type available. Stepped sleeve joints increased the size of connecting boxes, &c., 100 or 200 per cent., and the clamping screws were generally too small to ensure thorough contact between the conductor and the sleeve. The reduction in the current-carrying capacity of the cable by covering it with a thick layer of wood must be considered before deciding to adopt telegraph poles in place of sawn casing.

The advantages of the Powell system of wood preservation were discussed, and it was pointed out that its rapid adoption in tropical countries was due to its offering a perfect solution to the white ant difficulty, in addition to affording thorough protection to timber in other respects and considerably increasing its mechanical strength.

A visitor pleaded for the standardisation of whatever should be decided to be the best shaft-cable construction; the cost of manufacturing cable accessories and switch-boxes, &c., would be thereby reduced. Since enclosed switchgear had become standard for mining use, the manufacturing costs had fallen almost as low as those of the early open switchgear, owing to the greatly increased production of each particular type.

It was decided that the paper should be read and discussed before other branches of the Association.

Advertising Electricity.

By H. CLIFFORD PALMER.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS, *at Manchester, February 11th*, 1913.)

THE population of the British Isles is 42 millions, out of which the approximate total number of consumers of electricity is very little more than half a million; whilst the number of users of such articles as electric heaters, cookers, irons, kettles, sweepers, and other potential popular domestic appliances, is but a few thousands. A comparison of these figures will give much food for thought.

In the matter of public education as to the benefits of electricity, we have left undone much that we might have done. The subject of how electricity can and should be advertised is one that interests all alike—manufacturers, station engineers, and contractors. The subject of selling electricity merits the same care, thought, and action as that of plant and apparatus manufacture. Unfortunately, we have been too apt to overlook this important fact in the past.

A few years ago if we got electricity in the home for lighting we felt highly satisfied, and were content to leave it at that; now, lighting is only the beginning, and should in reality merely act as the missionary for electricity. Heaters, toasters, irons, kettles, breakfast-grills, sweepers, and many other current-consuming devices, should follow. But it cannot be expected that the public will adopt such apparatus unless they are educated as to its existence, its use, its advantages, and even its economies.

The natural tendency nowadays is to economise time, to avoid inconveniences, to study hygiene, and to save unnecessary labour; therefore we should play upon the sensibilities of mankind and womankind in these directions. Within limits electricity has extensively advertised itself. From its inception, its distinctiveness, its obvious advantages, and its many other qualities always ensured for it progress; but progress without "push" must be very tedious. Gas, although fighting a losing battle, is fighting it valiantly, and unless met in the field with equally modern weapons might easily stay our progress longer than any of us would desire. The gas interests have realised the value of co-operative effort, and have organised extensive advertising action accordingly. How much more successful might we be with similar measures?

What we need to popularise the domestic uses of electricity amongst all classes (and upon this depends, to a large extent, our future rate of progress) is a combination of effort in which all interested—*i.e.*, manufacturers, supply authorities and contractors—should join. An educative campaign is necessary.

The public can be educated on extensive lines only by systematic, judicious, and practical advertising. That advertising is work for specialists there can be no doubt. Because a man may have had a commercial training, he is not thereby qualified to conceive and carry out comprehensive and profitable advertising. Practical experience, study and ability are required.

The manufacturing section of the industry has done, and is doing, much in this matter of "Advertising Electricity," but the advertising of the manufacturer is directed to those who are already users of electricity; he is merely driving home his individual claims against those of his competitors. Our concern as an industry is not with those who have been converted, but with those whom we desire to convert.

The supply undertakings are already represented in London by what is known as the Electricity Supply Publicity Committee; the manufacturers are represented by the Publicity Section of the British Electrical and Allied Manufacturers' Association; whilst the contractors are represented by the Electrical Contractors' Association. A joint Electrical Publicity Association should be chosen to be composed of selected members from each of the before-mentioned Associations. The duty of this main Association would be to direct the operations (upon expert advice), and control the general policy, of a national educative electrical advertising campaign. Sub-committees could be formed by each Association for the purpose of obtaining the necessary funds.

No measure of success will be achieved unless the response is general. We are now a large industry, and if all contribute, the subscription need be only quite nominal. It cannot be expected that a few enterprising manufacturers and supply authorities would find the necessary funds for such a national scheme which would benefit all sections of the industry alike.

As to the money required to enable a comprehensive scheme to be organised to cover the entire country, I should like to see a sum of not less that £30,000 raised for a 12 months' campaign.

In order to demonstrate what class of advertising scheme could be carried on in a specified area for a given sum and for a given period, I propose to give a few facts depicting an imaginary campaign for London and the area within 50 miles thereof.

For the purpose of an "opening" campaign in the interests of electricity I would advocate the widest and most powerful methods of publicity. I am calculating on a total expenditure of £12,000, which amount would be necessary to enable a 12 months' comprehensive advertising effort in the area mentioned. I should therefore divide the operations as follows:—

(*a*) Daily Press advertisements (five-twelfths total expenditure).

(*b*) Literature and circularising (this to a considerable extent would be self-supporting) (one-twelfth total expenditure).

(*c*) Central information bureau (one-twelfth total expenditure).

(*d*) Billposting (two-twelfths total expenditure).

(*e*) Expenses of management and staff (one-twelfth total expenditure).

(*f*) Illuminated animated signs for night advertising (two-twelfths total expenditure).

Editorial notices in the daily and weekly Press would be covered by the Press advertising.

Of available styles of media for a campaign of this nature, I would recommend the principal daily (morning and evening) papers, as they give more desirable publicity for a stated amount than any other. The Press campaign should be divided into two periods of three months each. The first period, say, the middle of March to the middle of June, should be devoted to cooking, ventilating, and other domestic applications, with power intermixed. The second period, from the middle of September to the middle of December, should be devoted to lighting and heating, also with power intermixed. I would recommend that the insertions should appear not less than one per week in each paper, the size of the advertisement varying from time to time according to the total sum allocated to the paper in question. For the opening of the campaign and for any special occasion (such as the opening of the London Electrical Information Bureau referred to later), full pages should be taken in papers enjoying the greatest and most influential circulation.

Editorial notices come as a sub-heading to Press advertising, since to some extent the one carries the other. By this I do not desire to indicate that the money spent on advertising would positively buy for us the editorial columns of London's leading daily papers without further question; but no matter what may be said to the contrary, it would be bound to obtain for us greater recognition by the Press than we enjoy to-day. After all, it is only reasonable that the papers should expect some *quid pro quo*. Never at any time throughout our scheme (if we succeed in organising it) need we ask the papers for "puff"; but we shall need constantly to

advise them of current items of interest which may affect our industry. Every week we could undoubtedly circulate to the editorial departments of various papers little paragraphs which they would welcome, and which would interest us all indirectly.

If such a scheme as I am now suggesting does mature, I can foresee the day when the London and provincial papers will be willing enough to insert pages of popular Electrical Notes, in similar manner to the pages which now exist in most of our premier papers on Motor Notes, Fashion Notes, Empire News, Cycling Notes, &c. It is merely a question of proper recognition and support. Surely the diversity of domestic interests in electricity are sufficient to warrant such action by the Press. We do not want the daily and weekly papers to labour with the technicalities of our industry, as for this purpose we have our own excellently-conducted trade organs; but we do want the general Press to dilate upon the subject of electricity from a domestic and popular point of view; and this they will be ready enough to do if we recognise them as we desire they should recognise us.

I illustrate a few examples of Press advertising, in order to portray a style which might be adopted in connection with a scheme such as I advocate.

Full pages in London's daily papers are somewhat costly, so that their number in such a scheme would require to be limited. Following, therefore, upon first announcements, the size of space would be reduced to possibly a full double-column announcement, such as "Just switch on." Then, perhaps, a half-page, such as "Cleanliness, comfort, safety," following with a variety of other sizes, such as half double-column, quarter double-column, &c.

A considerable number of inquiries would be received by the Publicity Association from its members for the supply of suitable literature descriptive of the various applications of electricity. Provision would, therefore, have to be made for the origination and supply of this. Circularising can be termed "intensive" advertising. If properly carried out, it can, no doubt, be made very

There would be little gained in using this Bureau as a demonstrating showroom, as this work would be too restricted at one address and could be better administered from local showrooms in all districts.

One of the most valuable functions of the Central Bureau would be the arrangement of cooking demonstrations, and lectures in connection therewith. This is a form of publicity which should bring electrical apparatus most closely to the notice of the public.

Opinions are divided as to whether the contractor or the supply undertaking, or both, should run local showrooms, with the result that in many cases instead of the two interests running in harness they run in opposition. In the interests of the general cause this might be properly organised on co-operative lines. Where the contractors have already been sufficiently enterprising and have established good showrooms, station engineers should officialy recognise them as sources of electrical information and should recommend the local public to make use of them as if they were actually established by the undertaking itself. In other directions the showrooms already established by the supply undertaking would be the more desirable.

What is required in connection with a national scheme is undoubtedly the establishment of, at any rate, one first-class showroom in every centre, where all the most modern appliances can be viewed and capably demonstrated, where every possible information as to cost, comparative rates, advantages of electricity over coal or gas, manufacturers' list prices, addresses of local contractors, new developments, &c., will be properly registered and always kept available for the benefit of the public.

All such showrooms—whether already established or yet to be arranged for—should be more or less uniform as far as style and lay-out are concerned. Also, they should be properly equipped with all possible information needed by the public, and each should be under the control of a man who is accustomed to deal with the public. Only such a body as that suggested could possibly under-

Suggested Examples of Press Advertising

effective; but it is, of course, limited in its sphere of operations, and for this reason should be handled independently by the various supply undertakings, manufacturers and contractors.

All subscribers to the Publicity Association desiring to do so should be entitled to purchase the Association literature at special rates, which undoubtedly would enable them to effect considerable savings on their present expenses in this direction, whilst at the same time obtaining the right material.

The supply authorities in all parts of the country should not diminish their individual publicity operations on account of the fact that a broader scheme might be in operation; the one is merely intended to support the other.

To meet the requests for ready-made literature I suggest a series of, say, six booklets. These should be made as attractive as possible, yet should differ widely in appearance from one another. It must be remembered that repetition begets familiarity; and familiarity breeds contempt. The points to be emphasised throughout are the convenience, cleanliness, hygienic qualities, reduction of fire risks, simplicity, and economy of electricity for all purposes.

I would advocate an extension at a later date by issuing separate booklets appealing to distinct industries.

Wherever "intensive" advertising is concerned, avoid generalities so far as possible. Know as much as is possible of the local conditions under which electricity would be used, and convince the reader that his particular requirements have been carefully studied.

I believe there will be general agreement as to the desirability of having a London address for the Publicity Association, no matter what class of scheme is decided upon. Even with the national scheme London would undoubtedly from all points of view be most desirable for the headquarters. From there all the "extensive" advertising of the scheme would be conducted. Moreover, such headquarters would act in an advisory capacity as far as publicity is concerned for the benefit of all members of the Association.

take this work, and then probably only in connection with a scheme for national advertising. Sales should not be effected at these authorised showrooms.

For outlying districts where local showrooms would not be justified, it might be possible to organise a small travelling exhibition, to move from district to district, staying for four to six days in each. Practical demonstrations should be given by a capable lecturer, with lectures on the subject of heating and cooking by electricity.

Bill posting, again, is "extensive" advertising—in fact, the most extensive of all. Press advertising and bill posting work in entirely different directions, and yet posters aid Press work to a very considerable degree. If I were asked to describe the difference between advertising by poster and advertising in the Press, I should class the former as a "shop window" and the latter as a salesman therein. We cannot expect actually to sell by poster, but we can obtain magnificent publicity, which can be followed up in the most desirable and effective manner possible by augmentative copy in the daily papers.

In bill posting, bold methods should be adopted, first in the size of the bill, secondly in the selection of colour scheme, thirdly in the design, and fourthly in the point made. As a general rule, the less said on a poster the more effective the bill is likely to be. No attempt should be made to make more than one point.

In the scheme which I have discussed I would make provision for a permanent display over two periods of three months each, of about 1,100 16-sheet d.c. bills on selected bill-posting stations in the most prominent thoroughfares in London and Greater London. For the spring and summer campaign I suggest two bills, one advertising electric cooking and the other advertising ventilation by electricity. In fair weather it is generally safe to reckon that two bills must be allowed for each position for a three months' display, so that, if the cooking bill went up first, when a renewal was necessary the

ventilating bill could be put in its place, or *vice versa*. In winter time, an average of 2½ bills per position should be allowed, as renewals are naturally more frequent, on account of rougher weather. In the autumn campaign, I recommend the adoption of similar measures, showing first an advertisement of electric lighting and replacing it with electric heating.

The size of bill which I suggest measures 10 ft. × 6 ft. 8 in. upright. Bill posting requires thoroughly careful handling, otherwise leakages are bound to occur.

By the employment of illuminated animated signs, it would be possible to make one of the most powerful appeals to the public. Again "extensive" advertising, this follows on the same course as bill posting. It never fails to attract, as it stands out in strong contrast with the darkened surroundings, and we, as an industry, have every facility for the production of novelty in this direction. Positions should be chosen with every care, and our appeal made in the most animated form possible. After a suitable "run" in the metropolis, the signs could be re-erected in prominent provincial centres, and so go on perpetually doing good.

Rents for good positions are usually heavy, and this fact, combined with the excellent publicity value obtainable, would prompt me to allocate two-twelfths of my proposed expenditure for this particular purpose.

The proposed Publicity Association should do the "extensive" work only; its establishment need in no way interfere with the individual efforts of supply authorities, manufacturers or contractors, each of whom would continue to advertise "intensively" as hitherto.

Individual efforts, whilst highly desirable, are not sufficient; results of infinite value might be obtained by co-operation. Local efforts might interest a town, but a general campaign would set the nation thinking.

It is a policy which has been openly advocated for some time past by several of the electrical trade journals.

Discussion.

Mr. W. E. Warrilow said that this important subject had already been hammered at during a recent discussion in London on the wider uses of electricity. The Press men had also been hammering at the same thing in their columns, and endeavouring to bring about the crystallisation of the various interests concerned. The gas people had already got ahead on this matter, the B.C.G.A. having pursued a line of action for some time similar to that suggested by the author. The B.C.G.A. levied a toll on its members based upon the output of each undertaking, and was supported by the municipalities and gas companies throughout the country. The Electricity Supply Publicity Committee was supported by the London companies by contribution, but he did not know of any Municipal Supply Committee which subscribed direct to that body, though the municipalities purchased pamphlets and booklets from the Committee. The fact that the I.E.E. had formed a Publicity Section, showed that the manufacturers were getting together on a most important question. The author had suggested that the London and Provincial papers would write up electrical notes on the same lines as cycling and fashion notes; he did not think this procedure would appeal to the public. In the case of money spent by the Gas Association, there was nothing to show that they had been able to influence the Press to put in articles and notices as to the delights of gas. Many firms who had been purchasing space for many years, had used this space for communicative articles set up in almost the same type as the text of the paper. The B.C.G.A. did not advertise electricity in any way by depreciating it, and in advertising electricity the advertisements should be free from reference to gas matters. Station engineers did not care for stereotyped material. They preferred to add local colour to the publications, and in view of additional business, to give the order for printing to a local firm. The central information bureau should act almost entirely in an advisory capacity.

Mr. A. G. Seaman said it was only by making people realise that something greatly to their advantage was offered that they could push the industry along, and the time was now ripe for so doing. The domestic applications of electricity were rapidly coming within the reach of an ever-increasing circle of people, and these facts ought to be brought prominently to the public notice. The expenditure necessary for carrying out such a scheme of publicity would have to be borne by all concerned in the industry, and a combined effort would be essential in order to carry out a comprehensive and thorough campaign.

Mr. F. C. Raphael said it was obvious that to advertise electricity more fully would benefit everyone concerned, and it was only a matter of ways and means. Had the author really thought out, not the desirability of such an association, but whether the proposition was within the bounds of practical politics? What would he offer to members who joined the Association? The whole industry would benefit equally, whether they joined the Association or not; and the only benefit that members would obtain would be advice gratis, which was never well received. Publicity literature was also offered at reduced rates, but, as already stated by a previous speaker, a great many engineers preferred to buy this locally. In his opinion, the author would find much difficulty in forming such an Association as was suggested. He had some time ago tried to make much of the point that advertising in the daily Press should be indulged in to a greater extent. If every electrical supply undertaking would contribute an average of £50 a year, a sum of about £25,000 a year would be available. The figure quoted in the paper for daily Press advertising was not enough. Local advertising was permissible, but he did not know whether in municipal undertakings this power was extended to general advertising. Billposting should not be carried to excess. Press advertising was much more remunerative and warranted a much larger proportionate outlay. Notices written by an advertiser were nearly always recognisable, and they could only be made unrecognisable by much labour on the part of the sub-editor to whom such duties were usually relegated, and further, the advertising man did not look kindly upon such mutilation. There was more friction and trouble in connection with these "puff" notices than in connection with any other branch of paper work, and they were more difficult to handle than any amount of technical work. The same applied to some extent to daily Press work. If it was desired to get electrical notes into the daily Press, they must have first-class lectures by first-class lecturers, embodying new ideas on electrical subjects. He did not believe in the ordinary showroom, and considered it an inefficient way of selling goods. If a supply undertaking had a showroom it should be able to sell the articles displayed.

Mr. B. Welbourn said that in the United States and Canada much greater use was made of electricity by the public than at home. He was not convinced that there was need for the Association suggested, but he did think that the scheme should be placed under the auspices of the parent Institution. Manchester appeared to be a much more central position for an association headquarters than London. The author appeared to lay too much stress on the domestic uses of electricity and not enough on the power side of the industry. There was nothing like the electric iron for bringing home the advantages of electricity for domestic purposes. In the case of a large London supply undertaking, a striking feature of the last year's business was the extraordinary number of extensions to installations for both lighting and power purposes.

Mr F. Walker did not think the author went far enough in speaking of a total outlay of £30,000. Many firms spent that amount individually on advertising in a single year. A recent exhibition in Scotland cost £200 for a week, and the engineer made the manufacturers pay most of the bill. The advertising of the domestic uses of electricity was primarily for the purpose of selling electricity, and, in consequence, was a supply company's job. The electricity supply undertakings were far behind the gas companies in advertising the sale of their product.

Mr. A. J. Greenly said that everyone agreed that there should be such an association, but would it control the advertising manager and advertising, or would it confine itself to the raising and administration of funds? The present Publicity Committee saw all advertisements and passed on all ideas for advertisements, and the result was not what it might have been. He thought the best way of obtaining new power consumers in all trades was through the medium of the trade organs.

Mr. L. F. K. Holmar said the point at issue appeared to be the getting of funds for the propaganda. The settlement of the different methods of advertising to be adopted would not be a difficult matter.

Mr. F. Sells approved of the principle of co-operation. If the idea were possible at all, it should be handled by an independent association; in the event of a subject of this kind being tacked on to the Publicity Committee of the I.E.E. and left half done, nothing further could be done. London was not the right centre for a movement of the kind suggested; if the meetings were held in London, the provinces would hear nothing further of the matter. Most of the money for the big electrical exhibitions, which had done a good deal of good to the industry, came from the manufacturers. A scheme of the kind proposed should be supported mainly by the supply undertakings. The attitude of station engineers was shown by their absence from the meeting; they were usually present when curves and technical papers were under discussion, but there were very few present to listen to a discussion on a purely commercial question. Mr. Sells agreed that showrooms did not help selling, they were bound to be a failure.

Mr. S. Rentell agreed with Mr. Sells in regard to showrooms. As already stated, the gas undertakings contributed towards their association, and there was no apparent reason why the electricals should not, through the M.E.A., adopt electrical advertising in a simple way on a similar basis.

The Author, in reply, said that many of the details in the paper had brought forth useful criticism, but it was not his intention to go further than indicate methods whereby a start might be made. He wished to emphasise the fact that he did not ask for editorial "puffs," as it would be quite possible to supply information to the Press generally in such a way that they would be glad to make use of the information as news purely and simply.

A Curiosity Abolished.—Visitors to Bournemouth, especially electrical men, will have noticed with great interest the old method of trimming the arc lamps on the very high poles which are so distinguishing a landmark of the town. Three men pushing a truck, containing a large cage, used to proceed to the foot of the mast; the cage was got into position, and all hands lowered a circular attachment, which was normally kept suspended at the top. The cage was hoisted with one man in it, who proceeded to trim and clean the lamps at the top of the pole. Now, this has all been done away with, and the modern, safe, and cheaper method of lowering the lamps has been substituted. The work, including erection, was done by the London Electric Firm, using their well-known patent contact-suspender and self-sustaining winch.

LEGAL.

Edinburgh Tramway Company's Appeal.

The First Division of the Court of Session has decided not to disturb the verdict of the jury in the action by an Edinburgh grocer who sued the Edinburgh and District Tramways Co., Ltd., for £1,000 damages in respect of injuries sustained by his son. Pursuer attributed fault to the defenders in respect that the driver of a car failed to keep a proper look-out and give warning of the approach of the car. Defenders denied fault and pleaded contributory negligence. The jury awarded pursuer £200 damages and the company applied for a new trial, but the First Division held that they could not disturb the verdict of the jury.

Electrical Supply Appeal Case in the Lords.

The House of Lords has been occupied with the appeal in the case London Electric Supply Corporation, Ltd., *v.* Westminster Electric Supply Corporation, Ltd. The matter is part heard, and will come on again to-day, when, in all probability, judgment will be reserved.

Slander Action at Aberdeen.

In the Second Division of the Court of Session, Lord Hunter heard counsel on the question of the allowance of issues for jury trial in an action by Mr. James Alexander Bell, M.I.E.E., M.I.M.E., electrical engineer of the City of Aberdeen, against Mr. Alfred Edward Milne, solicitor, 31, Adelphi, Aberdeen, hon. secretary of the Aberdeen Branch of the Electrical Contractors' Association, for £1,000 damages for alleged slander in respect of a letter written to the town clerk.

Mr. Wilton, counsel for defender, argued that there was no issuable matter, and that the action should be dismissed. Quoting from the condescendence, he said: "In carrying out his work, the pursuer was recently applied to by Mr. Alex. Davidson, solicitor, to advise him regarding the installation of a system of electric lighting and heating at his house, Broomhill Park, Aberdeen. Mr. Davidson had received an offer from Messrs. A. B. Robertson & Son, plumbers, Aberdeen, to execute the work of merely wiring in wood-casing, exclusive of lamps, distribution boards, or fittings of any kind. The pursuer, when thus applied to by Mr. Davidson, gave it as his opinion that the charge was excessive and that the installation could be carried out at a very much lower rate per point."

Counsel for defender next read the following letter (in which, he said, the alleged slander was contained), to Dr. Gordon, the town clerk, from 31, Adelphi:—

Aberdeen, November 27th, 1912.

Electrical Contractors' Association.

Dear Sir,—At a meeting of the above Association, held on Tuesday, 26th inst., the members had under discussion a complaint by one of the members against Mr. Bell, city electrical engineer.

The circumstances are as follows:—One of the contractors had been asked to tender for an electrical installation in Aberdeen. The gentleman for whom the work was to be executed met Mr. Bell, and in course of a conversation between them Mr. Bell expressed himself very strongly on the question of the immoderate cost of the installation in Aberdeen, and in reference to the particular contract stated:—"The work is done, and well done, in Edinburgh for 12s. 6d. per point, while your rate is 22s." Following upon this conversation the contractor received a letter from his client, in which he stated:—"I have no choice but to take in competitive offers, or throw up the whole idea if—for the reason indicated by Mr. Bell—none of the offers is at least moderately fair."

From the above you will, no doubt, observe that Mr. Bell has made very grave and slanderous charges against the Aberdeen contractors, reflecting upon their honesty. The Aberdeen contractors emphatically deny that work of the same quality and materials can be done at 12s. 6d. per point, and in evidence thereof refer you to any of the leading architects in Aberdeen, or to the Glasgow contractors, whose charge for the same work is from 25s. to 27s. per point. It will be within your recollection that similar charges were made by the city engineer in reference to the City Hospital contract. In particular, he stated that that contract could be done for half of the amount of the lowest Aberdeen tender, and in support of his contention he invited tenders from the south, which all exceeded those made by the Aberdeen contractors, thus conclusively showing that Mr. Bell's knowledge of electrical contracting work was very elementary.

Apart from this, however, the members consider that it is outwith the jurisdiction of the city engineer to interfere between contractor and client, and that all along Mr. Bell's attitude towards contractors has not been conductive to harmonious working between ratepayers and the official of a public department. In this particular case, Mr. Bell has asked one of his assistants to make a full specification for the electric installation. Mr. Bell and his assistants are paid salaries to look after the ratepayers' interests, but not to take work out of the contractors' hands. His actions, I am sure, must appeal to the members of the Town Council as most intolerable. In Glasgow, where there are many more contractors than in Aberdeen, the relations between the city engineer and the contractors are of a most harmonious nature, and there each endeavours to help the other as much as possible: whereas in Aberdeen there seems to be continuous trouble between the city engineer and the contractors.

Matters have now come to such a pass that steps must be taken to safeguard the interests of the contractors. They consider that they are being most harshly and unfairly treated by the city engineer, and they respectfully beg that the members of the Council will take such steps as they deem best for the protection of the contractors and the safeguarding of their interests.

I shall be glad if you will submit this letter to the Council at their meeting to be held on Monday first, and shall be glad to hear from you.—Yours faithfully,

A. E. Milne,
Hon. Sec.

Counsel (proceeding) said Mr. Cooper must admit or deny the truth of the statements he had read.

Mr. Cooper, K.C., for pursuer: I say the whole of the statements are false and untrue.

Lord Hunter: I see no reflection upon anyone's honesty. Supposing you extract a slanderous meaning from an innocent expression, can you describe that as in itself slanderous? It says that in Aberdeen they desire such heavy profits that they want twice as much as what contractors in Edinburgh want. That might be an idiosyncracy of Aberdeen.

Mr. Wilton said it was maintained by the other side that the letter imputed to the pursuer ignorance, incompetency and want of skill in professional duties, but he submitted it was not innuendo borne out at all by the particular passage in the letter. It merely meant that this gentleman had held his position for 15 years, that the electrical trade had developed very much since then, and although he might have been well up in matters at that particular time, he apparently was not abreast of modern conditions. Counsel submitted that the letter, on the whole, was a most reasonable production, and contained no malice and no excessive language.

Lord Hunter: That would be a privileged letter.

Mr Wilton: Yes: I submit that there must be malice, and there are no facts so far as this particular defender is concerned inferring malice.

A reference by counsel to the Trades Disputes Act, 1906, drew from his Lordship the observation that it would require very strong authority to convince him that, if the letter was slanderous, the Act of 1906 protected the defender.

Mr. Lippe, counsel for pursuer, pleaded that all the issues should be allowed. He quoted a Trade Union precedent where it was held that although the law protected the Trade Union, it did not protect the official who was the mouthpiece of the Union in uttering a slanderous statement. There was nothing in this case in the fact that defender happened to be a solicitor. He was there simply and solely as an official of a Trade Union, by whose hand the injurious statements were written reflecting upon the character of the pursuer. Referring to the third paragraph in defender's letter, Mr. Lippe pointed out that defender did not say, "In my opinion your electrical engineer does not have a great knowledge of his duties," but rather, "It conclusively shows he has a very elementary knowledge of his business." That, counsel thought, had been held in a case much weaker to be a direct charge of incompetency against a person in his professional duties. The Association took the opportunity to write to pursuer's employers to say that "this servant of yours knows little or nothing about the duties he has to perform"—clearly with a view to injuring him. If he had been dismissed for incapacity, what chance would he have had of getting another situation? The slander, if it was slander, was one of the gravest character. Accordingly he held that the language employed in the letter would amply bear the innuendo which the pursuer put upon it—that of "ignorance, incompetence, and want of professional skill." Therefore, he contended that the first issue should be allowed.

Counsel, proceeding, said there could be no possible privilege.

Lord Hunter: If you interfere with individual members of an Association and the interests of these members, the secretary of the Union may have an interest.

Mr Lippe: But I don't see how that will give him a privilege.

Lord Hunter: It may arise from the circumstances.

Mr. Lippe argued that defender himself, not being a member of the Electrical Association, cut himself adrift entirely from the plea of privilege. What privilege could he have except the privilege of his Association? He did not see how defender was different from any private individual in Aberdeen. He got no benefit from the Association.

Lord Hunter: Do you aver that in writing the letter he exceeded instructions?

Mr. Lippe: My contention is that defender cannot claim privilege and throw upon us the onus of imputing malice.

Lord Hunter: Any member of the public would be entitled to write.

Mr. Lippe: What right would the man in the street have to interfere in a dispute between the Electrical Association and the electrical engineer? If an ordinary member of the public had written a letter of this sort he would have pleaded in vain that he was privileged. In regard to the second issue, counsel's contention was that it was slander to say of another that he had committed slander. Defender distinctly charged Mr. Bell with having uttered slanderous charges. In their condescendence they said:—The letter further falsely and maliciously states that pursuer was guilty of making very grave and slanderous charges against the Aberdeen contractors reflecting upon their honesty, and that he has made similar very grave and slanderous charges on a previous occasion." If defender had charged them with saying that and it was not true, counsel thought it was perfectly obvious that that was a slander committed against them. Therefore the second issue, subject to his Lordship's suggestion as to the innuendo, should also be allowed.

Mr. Wilton said it was not disputed that the letter was written

so that the facts might be put before the Corporation. Plainly no malice was attachable to the association and the members of it, and equally no malice was to be attached to the solicitor or other official who was asked to convey the information. Surely a trader had a right to complain to the Corporation of the actings of one of their officials?

Lord Hunter: Not in respect of his actings towards a different member.

Mr. Cooper, K.C., for the pursuer, said their contention was that the so-called criticism in the letter was not criticism founded upon facts accurately set forth. Defender did not merely indulge in his letter in criticism, but he went into a criticism which was *per se*, and apart from everything else, libellous. Every day, he supposed, people were saying that particular people were charging too much for what they were doing. That was not a charge of dishonesty. If the defender had said that it was very unfair of Mr. Bell to go and do these sort of things that would have come within the region of fair comment upon facts accurately set forth, but he attributed to Mr. Bell the levelling of slanderous charges against Aberdeen contractors. The idea that a body holding extraordinary protection under the law could constitute itself a sort of censor on the public officials of a town, and although not monetarily interested in the matter at all, could send libellous letters to the Town Council about their officials, was a monstrous one. Regarding the question of privilege, he submitted that the defence had not produced a single authority that came within miles of the position.

Lord Hunter reserved judgment.

Damages against the London Electric Railway Co.

In the King's Bench Division of the High Court, on Monday, Mr. Justice Coleridge and a Common Jury heard an action in which Mr. Daniel Badcock, of Winchendon Road, Teddington, sued the London Electric Railway Co., Ltd., for damages for personal injuries.

Mr. Badcock's case was that, owing to a defect in the footway leading to the Bakerloo Tube at Waterloo, he fell and seriously injured his right shoulder, and Dr. E. R. Dawson, of Teddington, who gave evidence in support of the claim, said the use of the joint was permanently impaired.

The railway company disputed the claim, with a contention that the accident occurred on a part of the path that did not belong to them, but the jury eventually returned a verdict in favour of Mr. Badcock for £172 damages, and judgment was entered accordingly.

His Lordship granted the railway company a conditional stay of execution, with a view to a possible appeal.

Osram Lamp Patents.

In the Chancery Division, before Mr. Justice Parker, on Friday, February 21st, the alleged infringement of Osram lamp patents was the subject of a motion for an interim injunction.

Mr. Hunter Gray, counsel for the Osram Lamp Works, Ltd., Brook Green, Hammersmith, plaintiffs in the action, said he was moving for an injunction to restrain the defendant, M. L. Apple, from selling lamps which the plaintiffs contended were an infringement of their lamps. He understood that the defendant, who was appearing in person, had filed one affidavit which he would read, and that defendant would produce evidence at the trial with the object of showing that an essential difference existed between the Osram lamps and the Brewer lamps sold by the defendant. The filaments used in the Osram lamps were made by a chemical process, and the plaintiffs had evidence to show that that process was infringed. Counsel then read the affidavit of Dr. Oberlander who had examined the Brewer lamps. The affidavit was as follows:—"The whole of the lamps examined by me contain filaments made of tungsten, and from my examination I am satisfied that the process adopted in the manufacture consisted in mixing finely divided tungsten with an organic binding medium, subsequently carbonised, and that the greater part of the carbon was afterwards removed therefrom chemically. I know of no method of commercially effecting such chemical removal other than by the use of an atmosphere of steam and hydrogen as described in letters patent 23,899,* 1904, or the use of hydrogen and nitrogen as described in letters patent 18,622 of 1906."

Counsel then read defendant's affidavit in reply. Defendant said that Dr. Oberlander's expert opinion in the use of the words "finely divided" was too general, and was misleading. He (counsel) submitted that that was no answer, and that a chemical process was involved in the Brewer foreign-made lamps. Defendant got his lamps from abroad, but did not say in his affidavit by whom they were made nor by what process. The case was curious, in that it was impossible by analysis to find out the exact process involved. But he contended that where there was carbon left in the finished filament, then that filament could not have been made without infringing one of the two processes covered by the Osram patents.

The Defendant, addressing his Lordship, said that, as a matter of fact, he did not supply Osram lamps or lamps like the Osram lamps at all, either by himself or by agents. His lamp was of an entirely different make, and the plaintiffs were a great company, who merely wanted to crush him down. He was fully prepared to offer evidence to prove that his lamps were entirely different.

Mr. Justice Parker: You will have full opportunity to do that at the trial.

Defendant, who was a foreigner, said something in reply which was inaudible.

His Lordship: You don't say how your lamps are made, though you say you are prepared with evidence, and I am afraid I shall have to restrain the sale of your lamps pending trial. But you will have an undertaking as to damages from the plaintiffs, and if your contention is right you will recover heavy damages.

Defendant repeated that he did not sell Osram lamps.

Mr. Gray: He (meaning defendant) is one of those gentlemen who gets his lamps from abroad, and it is practically impossible to stop them.

His Lordship, in granting an injunction, referred to the defendant's affidavit, and said that though defendant swore that he got his lamps from abroad, he did not condescend to say how they were made nor by whom. That was not satisfactory, although he said he was going to give evidence at the trial, for it was impossible to say from what source that evidence was coming. He would, therefore, grant an injunction pending the trial with a proper undertaking as to damages. Costs of the motion to be costs in the action.

His Lordship to the defendant: "You must not sell these things pending the trial, and you quite understand that if you are right you will get damages."

Isaacs *v.* Chesterton.

At Bow Street Police Court, on 20th inst., Sir Albert de Rutzen granted a summons on behalf of Mr. Godfrey Isaacs, managing director of the Marconi Wireless Telegraph Co., Ltd., against Mr. Cecil Chesterton, editor of the *New Witness* (formerly the *Eye Witness*), in respect of a series of libels published between October, 1912, and January, 1913. The hearing began on Wednesday, February 26th.

Osram Lamp Co., Ltd. *v.* Schloss.

In the Chancery Division on Friday, February 21st, before Mr. Justice Swinfen Eady, Mr. Gray mentioned a motion in this action which, he said, was to restrain infringement of patent. Defendants, however, required further time to answer evidence; and plaintiffs, with his Lordship's sanction, were disposed to give them another week.

His Lordship granted a week's adjournment.

Austria's Foreign Trade.—The foreign trade of Austria in electrical goods during the year 1912 was of a satisfactory character, the imports showing an increase of 10,000,000 kronen, and the exports of 2,500,000 kronen. In detail, there was an increase of 30 per cent. in the imports of dynamos, low-pressure apparatus, measuring and calculating instruments, glow lamps, high-pressure apparatus and carbons; of the imports, 90 per cent. came from Germany. The exports of dynamos reached values more than double those of the previous year. A considerable rise marked also the exports of switch and contact appliances, cable and wire. On the other hand, only a moderate increase was shown in the shipments of glow and arc lamps and carbons compared with the previous year. The shrinkage in the export figures is due less to the falling-off in the Eastern, than to the declension in the general European, shipments. The exports for the year totalled 76,028 quintals, of a money value of 41,556,900 kronen, of which dynamos stood for 42,599 quintals, worth 14,480,800 kronen. The exports were 37,982 quintals, valued at 12,532,200 kronen, of which dynamos were 6,150 quintals, of a money worth of 1,344,100 kronen. As stated previously, Germany almost monopolises the Austrian import trade, 10 per cent. of it only being left to other countries, of which Switzerland appropriates the larger portion, the British share being restricted to small shipments (27 quintals) of dynamos, motors and transformers: measuring and calculating instruments (52 quintals); electric lamp fittings (23 quintals); electrical apparatus (200 quintals); cable and insulated wire (30 quintals); and carbons (58 quintals). The chief customers for Austrian exports of electrical goods were the Balkan States, Greece, Russia, Italy, Turkey, Egypt, Spain, the United States, &c., England's small purchases comprising glow lamps (451 quintals), cable and insulated wire (409 quintals), gutta-percha-covered cable and wire (36 quintals), asbestos and paper-covered cables and wire (304 quintals), and carbons (2,052 quintals).—*Elektrotechnik und Maschinenbau.*

Cinematograph Films of Cable Manufacture.—We are informed that the A.E.G., of Berlin, have just produced a series of cinematograph films showing the process of manufacturing electric cables from start to finish, and are prepared to lend these films to technical Societies and Institutions for lectures. Every stage of manufacture is shown, from the arrival of the copper ingots to the dispatch of the completed cable, and the A.E.G. have prepared an explanatory lecture to accompany the exhibition of the films. If necessary, they are willing to send an expert to deliver a special lecture. The company only provide the films, and societies using them must make their own arrangements for exhibition, and must provide the apparatus. If possible, the exhibition should take place in a properly equipped cinematograph theatre, but if an ordinary lecture hall is used, care should be taken to keep down the noise of the apparatus as much as possible, so that this does not interfere with the delivery of the lecture. Most of the pictures being of interiors, it is recommended that a 70-ampere projector lamp be used, in order to give the necessary clearness to the pictures on the screen. Application for the loan of these films should be made early to the Electrical Co., Ltd., Charing Cross Road, London, W.C., the British representatives of the A.E.G.

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

3,351. "Process of and means for moulding telegraph, telephone and like insulators." D. G. Norman. February 10th.

3,357. "Fuse or joint boxes or the like electrical fittings." C. P. Melander. February 10th.

3,370. "Apparatus for heating liquids electrically." K. P. H. Syndicate, Ltd., and C. Kratt. February 10th.

3,387. "Receptacles for diaphragm guards for telephone mouthpieces." F. Lowenstein. February 10th. (Complete.)

3,404. "Shade or globe holder for lamps." F. A. Basnett. February 10th.

3,431. "Circuit arrangements for automatic or semi-automatic telephone systems in which there are several lines to a station or group of stations." Siemens & Halske Akt.-Ges. (Convention date, February 9th, 1912, Germany.) February 10th. (Complete.)

3,439. "Telegraph system, unaffected by static charges from neighbouring high-tension lines." Siemens & Halske Akt.-Ges. (Convention date, February 12th, 1912, Germany.) February 10th. (Complete.)

3,446. "Protective device for the circuits of electric motors." S. L. Glenn and British Pneumatic Railway Signal Co., Ltd. February 10th. (Complete.)

3,462. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 10th.

3,466. "Electricity meters." J. Elster. February 10th. (Complete.)

3,487. "Ignition gear for internal-combustion engines." W. H. Moore and A. Shardlow & Co., Ltd. February 11th.

3,512. "Electrodes for electric arcs." H. Ayrton. February 11th.

3,525. "Process for the production of a tungsten compound for use in the manufacture of electric incandescence filaments or bodies." F. Hansen and W. F. Mohr. (Divided application on 9,941, 1912. July 25th.) February 11th. (Complete.)

3,539. "Method of and apparatus for increasing the effect of variations of electric current." A. C. Fuller. February 11th.

3,562. "Electrical advertising signs, devices, or the like." L. Martin and G. Nikey. February 11th. (Complete.)

3,565. "Electric motor control systems." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 11th.

3,566. "Manufacture of a material suitable for electrical insulation and other purposes." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 11th.

3,582. "Automatic telegraph transmitter." E. J. Kessels. (Addition to 21,832/12.) February 11th.

3,587. "Telephone receivers." E. Grissinger. (Divided application on 7,482/12, March 27th.) February 11th. (Complete.)

3,591. "Device for packing eggs, incandescent lamp bulbs, and other breakable articles." J. B. Warren. February 11th. (Complete.)

3,627. "Field magnets for dynamo-electric machinery." Siemens-Schuckertwerke G.m.b.H. (Convention date, February 17th, 1912, Germany.) February 12th. (Complete.)

3,656. "Sockets for incandescent electric lamps." H. Hubbell. February 12th. (Complete.)

3,679. "Electric ignition devices." H. A. Palmer. (F. J. Palmer, India.) February 12th.

3,680. "Apparatus for printing tickets or the like automatically by selectors." Allgemeine Elektricitats Ges. (Convention date, February 23rd, 1912, Germany.) February 12th. (Complete.)

3,682. "Sockets for incandescent electric lamps or the like." H. Hubbell. February 12th. (Complete.)

3,684. "Motor control systems." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 12th.

3,685. "Electric motor control systems." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 12th.

3,695. "Metal-filament electric light bulb." E. Milnes. February 13th.

3,719. "Electrically-propelled vehicle or locomotive trolleys." W. Duff. February 13th.

3,732. "Revolver-switch safety-fuse plug." O. Weiss. February 13th.

3,749. "Tungsten-filament and a process of manufacturing same." M. M. Hubers, executrix of J. Hubers. (Julius Pintsch Akt. Ges., Germany.) (Divided Application on 8,758/12, April 13th.) February 13th.

3,759. "Electric driving mechanism for spindles, flyers, or similar parts used in machines for working textiles." Soc. L'Eclairage Electrique. (Convention date, April 16th, 1912, France.) February 13th. (Complete.)

3,771. "Wireless signalling." J. L. Fenemore, jun. February 13th.

3,779. "Electric candle fittings." F. Hodgson. February 13th. (Complete.)

3,780. "Telephone sub-station circuits." E. Grissinger. (Divided application on 7,482, 1912, March 27th.) February 13th. (Complete.)

3,805. "Electric lamps." W. E. Bladon. February 14th.

3,817. "Electric control on three or more wire circuits." E. E. Tasker. February 14th.

3,820. "Portable apparatus for generating electric currents for lighting or other purposes." R. V. Mostyn. February 14th.

3,825. "Time switches." F. Krupp Akt.-Ges. (Convention date, March 15th, 1912, Germany.) February 14th. (Complete.)

3,853. "Submarine telegraphy or telephony." Signal Ges. m.b.H. (Convention date, February 17th, 1912, Germany.) February 14th. (Complete.)

3,855. "Electric regulating liquid resistances." H. C. E. Boutard. February 14th. (Complete.)

3,857. "Trolleys for electric traction systems." E. M. Monro and R. E. T. Construction Co., Ltd. February 14th.

3,861. "Primary electric batteries." G. S. Engle. (Convention date, October 8th, 1912, United States.) February 14th. (Complete.)

3,864. "Electric heating and lighting devices." A. C. Michie and Sir R. A. S. Paget. February 14th.

3,880. "Alternating electric current generators." H. K. Whitehorn and Submersible & J. L. Motors, Ltd. February 14th.

3,882. "Method and apparatus for suppressing the interruption arc on switches." W. Buestyn. February 14th. (Complete.)

3,885. "Automatic transmitters for telegraphic signals." Creed, Bille and Co. (Harold Bille, United States.) February 14th. (Complete.)

3,923. "Electric contact plug." J. S. Holmes. February 15th.

3,931. "Shade-holders for incandescent, electric, and other lamps." D. G. Saunders, Jun. February 15th. (Complete.)

3,934. "Testing the sound-receivers of submarine signalling apparatus." Signal Ges. m.b.H. (Convention date, March 9th, 1912, Germany.) February 15th. (Complete.)

3,943. "Electro-vacuum safeguard alarm against burglary and fire." W. S. Vale. February 15th.

3,962. "Call or alarm apparatus for use in wireless telegraphy." Marconi's Wireless Telegraph Co. and H. Dobell. February 15th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

Automatically-controlled Electric Switches. F. P. Clifford. 3,915. February 16th.

Electrical Switches. H. W. Cox. 5,280. March 2nd.

Apparatus for Charging Accumulators. K. von Dreger. 5,434. March 4th. (March 3rd, 1911.)

Electrolysis of Liquids. J. G. Paulin. 6,261. March 13th.

Electrical Furnaces. I. Rennerfelt. 7,367. March 26th.

Electrotype and Process for the Production thereof. J. Murray. 8,746. April 18th.

Portable Electric Reading Lamp. S. J. Levi, A. H. Rose and T. A. Rose. 9,442. April 22nd.

Electric Fuse. W. B. Boyd and J. B. Tannahill. 12,273. May 23rd.

Telegraphic Photography. C. Stille. 12,709. May 29th. (June 2nd, 1911.)

Mercury Switches and Arrangements for Starting Electric Motors by Means of the Same. Siemens Schuckertwerke Ges. 14,087. June 17th. (June 21st, 1911.)

Process for Manufacturing Fireproof Electrically-Conducting Moulded Bodies. Geb. Siemens & Co. 16,044. July 9th. (July 20th, 1911.)

Feeding Mechanism for the Electrodes of Electric Arc Lamps. F. Steinert. 19,425. August 24th. (Divided application on No. 1,755 of 1912, January 22nd.)

Electric Animal and Insect Exterminators. C. C. Tuch. 29,851. October 7th. (October 17th, 1911.)

Self-acting Electric Switch Devices. Schott & Gen. 25,518. November 17th. (November 18th, 1911.)

Depolarising Agents for Galvanic Cells. British Ever-Ready Electrical Co. (Heil.) 25,784. November 9th.

Moving Coil, Electrical Measuring and Like Instruments. J. W. Record. 26,241. November 15th.

Moving Coil, Electrical Measuring and Like Instruments. J. W. Record. 26,242. November 15th.

Typewriters and Analogous Devices Adapted to be Operated by a Perforated Tape or the Like. A. Fraser and Eastern Telegraph Co. 1,822. January 23rd.

Automatic Battery over Discharge Preventer. H. Leitner. 2,310. January 29th.

Electrical Water-Heaters. M. H. Schoenberg. 2,522. January 31st. (April 29th, 1911.)

Electric Switches. H. Leitner. 2,747. February 2nd. (Cognate application, No. 8,224 of 1912.)

Electrical Device for Catching and Destroying Flies and other Small Insects. A. J. Wright and W. W. Nibloe. 2,872. February 3rd.

Electrical Measuring and Signalling Instruments of the Moving-Coil Type. J. W. Record. 3,454. February 12th.

Electromagnetic Speed-varying and Reversing Gear. B. Brukwicki. 4,458. February 22nd.

Connectors or Lugs for Electric Conductors. J. E. M. Robb and J. Shaw. 5,907. March 8th.

Electric Insulators. Bullers, Ltd., and G. V. Twiss. 6,287. March 13th.

Wireless Telegraphy. A. E. J. Vlug. 10,111. April 29th.

Portable Electric Battery Lamps. B. Pordes. 11,359. May 13th.

Incandescent Lamp Sockets. A. Schuchardt. 12,672. May 29th.

Electric Switches. Venner Time Switches, Ltd., and R. C. Griesbach. 15,366. July 1st.

Timing Devices for Operating Electric Switches and other Apparatus. S. Chiger. 16,142. July 10th.

Electric Furnaces. L. Gonnet. 19,287. August 22nd. (March 15th, 1912.)

Production of Sheet Mica and the Like from Mica Waste and other Materials. F. Bölling. 21,445. September 20th.

Regulation of the Speed of Electric Motors. Siemens Schuckertwerke G.m.b.H. 23,341. October 19th. (October 18th, 1911.)

Electric Conduit Junction Boxes or Like Electric Fittings. F. H. Terry, H. M. Bigwood and Brotherton Tubes & Conduits, Ltd. 24,492. October 26th.

Ignition Plugs for Internal-combustion Engines. A. Ruprecht. 28,412. December 9th. (December 11th, 1911.)

Driving of Vehicles by Means of Internal-combustion Engines Combined with Dynamos, Accumulators and Motors. H. Pieper. 29,636. February 9th. (February 20th, 1911. Divided application on No. 3,281 of 1912, February 9th.)

New Showrooms.—The full provision made by the General Electric Co., Ltd., for the display of various classes of its manufactures has been increased by the opening of a showroom in the basement of 71, Queen Victoria Street, E.C., where there is on view a comprehensive exhibit of arc lamps and accessories, Witton motors and machinery, ventilating and engineering supplies, telephones, electric light supplies, switchgear, &c. The new showroom is open for inspection by the public, and contractors are invited to send their clients to view it. The exhibits are set out on stands down the centre and round the sides of the rooms, the arrangement being such as to give every opportunity for close inspection. A large proportion of the apparatus is wired up, and can be seen in actual working.

Osram Costumes.—During the past few months an "Osram Lady" or an "Osram Man" has put in an appearance at entertainments, dances, balls, skating rink carnivals, &c., and we understand that those who have availed themselves of the outfit provided by the publicity department of the General Electric Co., Ltd., have found it an easy matter to make up fancy costumes sufficiently attractive to win prizes. We have received illustrations showing several simple, attractive combinations of Osram literature and lamps, which have been affected by prize-winners at Watford, Long Ditton and Weybridge carnivals, but the literature lends itself to many other attractive designs.